J.L. HOROWITZ

ENVIRONMENTAL ASSESSMENT

MAINTENANCE DREDGING

STONY CREEK HARBOR

BRANFORD, CONNECTICUT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.
02154

FEBRUARY 1977

SUMMARY SHEET

1. Name of Action: ( ) Administrative ( ) Legislative

2. Description of Action:

The subject action is to conduct maintenance dredging on the Stony Creek Harbor Federal navigation project in Stony Creek, Connecticut. The proposed action calls for the removal of shoaled sediments to maintain the authorized depth of the channel and turning basin. Estimates indicate that approximately 28,500 cubic yards of material will be removed. It will be excavated by a clamshell dredge and conveyed in scows to the New Haven disposal area in Long Island Sound.

3. Environmental Impacts:

a. Dredging Site - The proposed project will provide continued safe passage of all vessels using the harbor. The environmental impacts of the project would include short and long term effects. The direct effect of dredging includes the disruption of benthic communities, temporary increase of suspended solids, nutrient and chemicals in the water column. The local oyster beds will not be adversely impacted. Long term impacts are related to the continued use of the channel area by boaters and the repeated maintenance dredging. Benthos and water quality will experience continued disruption in the project area.

b. Disposal Site - The impact of disposal at the New Haven disposal site will be minimal. The small amount of materials to be disposed will not accumulate to any significant depth. Water quality will be temporarily degraded during the disposal period. Increased suspended sediments and lowered dissolved oxygen will be short lived. Some small sedentary benthic species and shallow burrowing forms will be affected, but the accumulation of sediments will be too small to adversely effect the biota in general.

4. Alternatives:

Hydraulic dredging with upland disposal was investigated but rejected since there were no areas within the pumping capability of a dredge which were either environmentally acceptable or made available by local officials. Beach nourishment was also considered but the material to be dredged consists of organic silt which is not suitable as a beach fill. No dredging was also reviewed.

1.00 PROJECT DESCRIPTION

1.01 Location and General Description. The Stony Creek Harbor Federal navigation project is located on the north shore of Long Island Sound in the town of Branford, Connecticut, about 8 miles northeast of Branford. The project is located in a cove adjacent to the mouth of Stony Creek, a small tidal stream located near the eastern boundary of Branford.

The cove is protected from the north and east by the surrounding shoreline. Partial protection from southwest winds and wave action is obtained from several shoals, rock outcrops and the Thimble Islands. The Thimble Islands are a group of approximately 30 small islands which are located about one mile offshore.

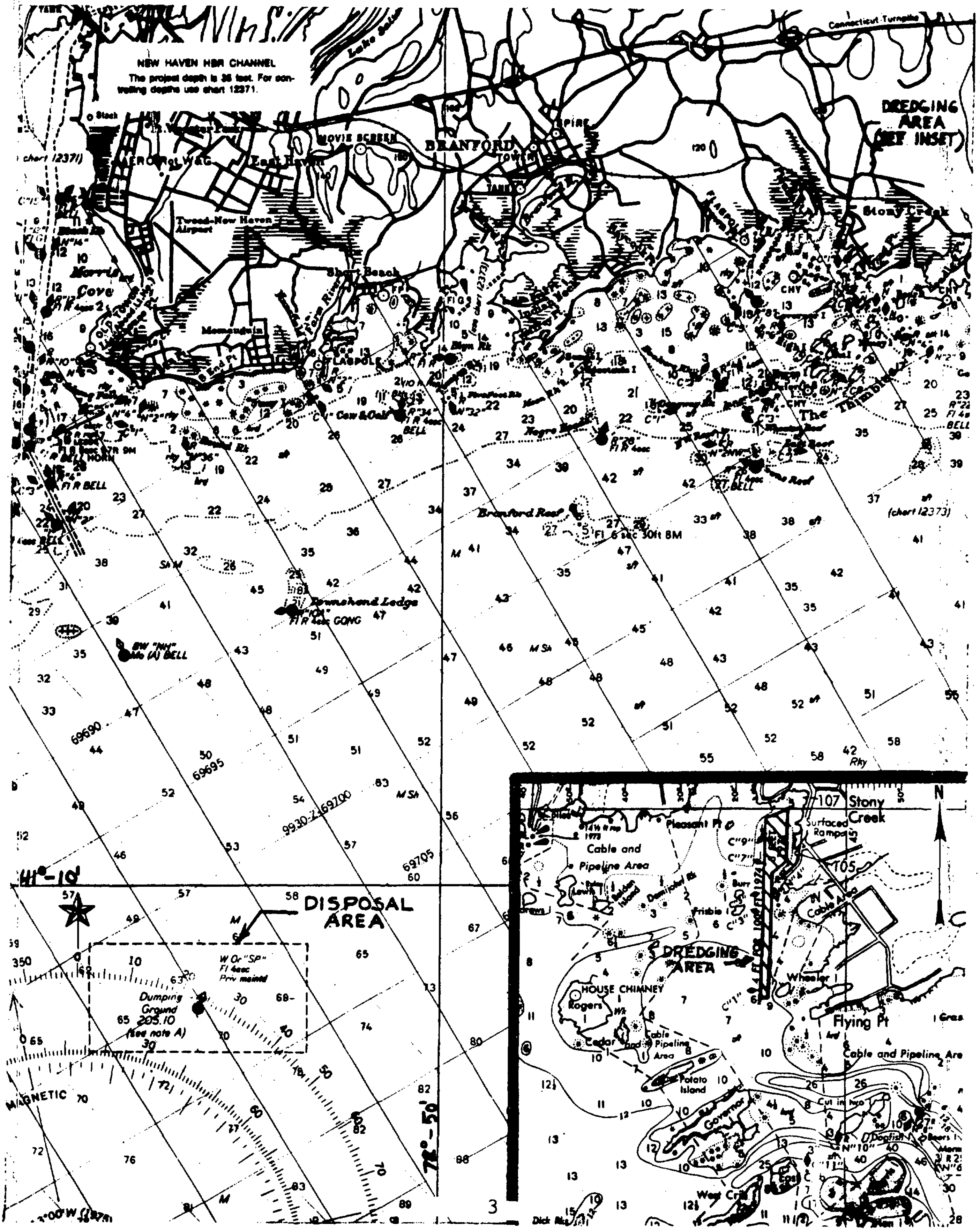
1.02 Existing Project. The existing Federal navigation project at Stony Creek Harbor provides an entrance channel six feet below mean low water (mlw), 100 feet wide from deep water in Long Island Sound in a northerly direction to a point 800 feet north of the Town Wharf. At the head of the channel an additional 200 foot wide area, 3.5 acres, is provided as a maneuvering basin.

1.03 Project Authorization. The Stony Creek project was adopted on 4 December 1967 by the Chief of Engineers under authority of Section 107 of the Rivers and Harbors Act of 1960. It was first dredged in 1970 when 76,000 cubic yards of material were excavated and disposed in the Branford disposal area in Long Island Sound.

1.04 Purpose of Maintenance Dredging. As a result of a hydrographic survey conducted in April 1974, the New England Division determined that dredging was required in the six-foot channel and maneuvering basin. Shoaling has reduced the available depth to such an extent that in places there is only 3.1 feet at mean low water. The dredging will restore the project depth of six feet. Preliminary estimates indicate the need to remove approximately 28,500 cubic yards of sediment. The shoal material will be excavated by a clamshell dredge and deposited in scows which will be towed to an open water disposal area.

1.05 <u>Disposal Area</u>. The disposal site is the New Haven Disposal Area, the center of which is located at approximately 41°-08'-56"N and 72°-52'-54"W. Depth of water at this site is approximately 70 feet. The disposal site is approximately 10 miles from the project.

1.06 <u>Compliance with Pertinent Public Laws</u>. The Marine Protection, Research and Sanctuaries Act of 1972 (Public Law 92-532), authorizes the Secretary of the Army, after notice and opportunity for public hearings, to issue permits or, in connection with Federal projects, to issue regulations for the transportation and dumping of dredged material into ocean waters. Section 404 of the Federal Water Pollution Control Acts Amendments (Public Law 92-500) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for the discharge of dredged and fill material into the navigable waters at specified sites. The Fish and Wildlife Coordination Act, 16 U.S.C. 661 et Seq. requires that any Federal agency authorizing the control or modification of any body of water must coordinate with the United States Fish and Wildlife Service and with the appropriate State agency exercising administration


NEW HAVEN HBR CHANNEL
The project depth is 35 feet. For controlling depths use chart 12371.
Connecticut Turnpike
MOVIE SCREEN
BRANFORD
SPIRE
DREDGING AREA (SEE INSET)
Stony Creek
Tweed-New Haven Airport
East Haven
Morris Cove
Momauguin
Short Beach
Farm River
LAGPOLE
Cow & Calf
Branford Reef
Fl 6 sec 30ft 8M
(chart 12373)
Townshend Ledge
Fl R 4sec GONG
BW "NH" Mo (A) BELL
The Thimbles
41°-10'
DISPOSAL AREA
W Or "SP" Fl 4sec Priv maintd
Dumping Ground 205.10 (See note A)
MAGNETIC
72°-50'
107
Stony Creek
Pleasant Pt
Surfaced Ramp
Cable and Pipeline Area
DREDGING AREA
HOUSE CHIMNEY
Rogers
Cedar Island
Cable and Pipeline Area
Potato Island
Frisbie
Wheeler
Flying Pt
Cable and Pipeline Area
Cut in two
Governor
Dogfish
West Crib
Dick Rks

over the wildlife resources of the affected State. Executive Order 11593, Protection and Enhancement of the Cultural Environment (13 May 1971), charges the Federal Government with a leadership role in preserving cultural resources. Compliance with these laws will be in accordance with existing regulations.

2.00 ENVIRONMENTAL SETTING WITHOUT THE PROJECT

2.01 Stony Creek Area. The area under consideration is a cove adjacent to the mouth of Stony Creek, a small tidal stream located near the eastern boundary to the Town of Branford, Connecticut, on the north shore of Long Island Sound. It is eight miles east of New Haven and about ninety miles northeast of New York City. About one mile offshore are the Thimble Islands, a group of more than 30 small islands, lying generally in a northeast-southwest direction. The shores of the harbor are composed of rock outcroppings and boulders fronted by mud flats at low tides. The cove at Stony Creek village is protected from the north and east by the surrounding shoreline. Partial protection from south-southwest winds and wave action is obtained from several shoals, rock outcrops and the Thimble Islands. Approach to the cove is generally made directly from the south through the Federal channel since prevailing depths in the approach from the west average only 1 to 2 feet. In the upper portions of the harbor, several acres of mud flats are exposed during periods of low tide. There are no bridge crossings over any portion of the Federal channel or maneuvering basin.

2.02 The nearest adjacent harbors for small fishing and recreational craft are the privately improved Pine Orchard Yacht Basin, one mile to the west, and the federally improved harbors at Branford and Guilford. Branford Harbor lies three miles west of Stony Creek while Guilford lies five miles to the west. The present demand for boating facilities in Connecticut, and the increase in leisure time and money available for recreational boating has contributed greatly to the present need for maintaining facilities for recreational craft in the area. Specifically, the facilities in the existing harbors are used continually and maintenance is needed. Stony Creek has public shore access already available making it a valuable site for navigation and recreation. During 1975, the following usage was reported for the project:

a. Commercial Use - Small fishing boats having drafts to 3 to 4 feet made 60 vessel trips and delivered approximately 3 tons of shellfish to the port.

b. Recreational Use - Pleasure craft having drafts of up to six feet accounted for 10,875 vessel trips.

2.03 Existing Projects. There are no Federal navigation projects in the immediate vicinity of Stony Creek. An unfavorable report was made in 1891 for navigation improvements of the entrance to a tidal creek referred to as Stony Creek River, east of Bear Island and Hoadly Point.

2.04 The nearest existing Federal navigation project is Branford Harbor. This project consists of a channel 8.5 feet deep, 100 feet wide from the outer harbor to the highway bridge at Indian Neck Road, a distance of about 2.3 miles.

2.05 Regional Area. The Town of Branford straddles the east-west Interstate Highway 95 just to the east of New Haven - an important road on the major axis of urbanization in the northeast. It is not surprising then that Branford has been a fast growing town. Between 1950 and 1960 Branford's population increased from 10,900 to 16,600 and climbed to 19,200 by 1965. The town gained 23 manufacturing establishments during the 1950's. Manufactured products include wearing apparel, metal castings, drawn wire, and screw machines. Its manufacturing employment reached 2000 in 1962. This was somewhat higher than the 1700 employed in non-manufacturing activities. About as many more commute to work in the greater New Haven area. Continued strong growth seems certain. There is plenty of space in the town for growth; and State Planners have projected the New Haven area to grow by 70 to 100 percent between 1960 and the turn of the century.

2.06 The 1975 population of Branford is estimated to be 21,000. In 1970, the population reached 20,444 an increase of 23 percent for that decade. The 1970 census indicated that Branford's population is largely young adult with 45 percent between the ages of 20 and 54. The age group of 1 to 20 comprises the second largest group with 36 percent of the population. The remaining 20 percent of the population is over 54. Population projections for Branford are estimated to range from 23-700 by 1980 and 27,000 to 33,500 by 1990. Population density ranges from 800 to 1,000 people per square mile, but this density increases to over 2,000 people per square mile along the shoreline of Branford. The ethnic stock of Branford is primarily of European origin.

2.07 Income. The average annual income of a Branford family is typically much higher than both the national average and its nearby metropolitan neighbor, New Haven. Data from 1966 indicate that the average annual income in Branford was $9,959, and rose $11,900 in 1971. While the majority of Branford's residents are well above the Federal poverty guidelines, 10 percent of the town's households are not. Since 1965, the primary creators of new employment opportunities have been local government (25.6 percent), retail trade (22.1 percent), primary metals (15.7 percent), and service industries (10.5 percent). The closing of Branford's oldest industries in 1970 created a short-term loss of employment, but new industries have in general made up for this reversal. Unemployment in Branford reached 7 percent in 1971 due to primarily the closing of the Malleable Iron Fitting Company.

2.08 Education. There are seven elementary schools, one junior high or intermediate school, and one senior high school, a parochial school and two libraries in the area. Branford has expended approximetely 55 percent of its town budget since 1950 to improve the school system. The median education level for Branford citizens is 12.3 years. Over 15 percent of the heads of families have completed four years of college. Over 33 percent have four years of high school and 52 percent have less than a high school education.

2.09 The village of Stony Creek lies adjacent to its harbor and maintains residences for year round and summer people. Homes in the area surrounding Stony Creek range in value from $20,000 to approximately $120,000, and shelter a population slightly larger than 2,100 people. The community lies within an accessible commuting distance to Branford, New Haven, Bridgeport, Hartford and several small cities and business centers.

2.10 Many of the year round residents cater to summer recreation seekers. The single industrial activity is shipment of trap rock by the New Haven Trap Rock Company from their dock located about three-quarters of a mile west of Stony Creek. Inland from the harbor there is a small amount of truck farming. The area is served by a network of roads and the shoreline route of the New York - New Haven and Hartford Railroad. The Branford Steam Railway, a subsidiary of the New Haven Trap Rock Company, hauls crushed stone from its quarry in North Branford to dockside at Juniper Point for shipment throughout the Long Island Sound area.

2.11 Geologic Elements. The Branford quandrangle is located on the boundary between the Central Lowland and the Eastern Highland regions in southern Connecticut. The surficial geology is primarily the result of features developed by glaciations which crossed the area in a direction west of south. Till mantles a large portion of the area but is thin or absent over many ridges and hills. Stratified glacial drift deposited during the period following deglaciation was comprised of ice-contact deposits in the southeastern section, valley train deposits in the west, and stratified silt and clay deposits in a glacial lake in the Quinnipiac Valley area. During dissection of the valley trains have deposited wind-blown sand and silt in thin patches along the valley walls. Numerous swamps, locally thick along the shore, developed into tidal marshes.

2.12 Bedrock of the region consists of two very different rock groups, divided by a major fault known as the Triassic border fault that trends southwest-northeast immediately west of the town of Branford. Northwest of the fault, the rocks consist of pink, brown and red arkosic sandstone conglomerate, and siltstone and shale of Triassic age. Interbedded with these sedimentary rocks are flows and intrusive bodies of diabase and basalt. A southeasterly dip of 10^{o} to 30^{o} accompanied by local cross folding controls the trends of ridges and valleys in this area.

2.13 Southeast of the fault the rocks are comprised primarily of granite and gneiss of Pre-Triassic age. These rocks are generally massive with well-developed jointing frequently injected by the conspicuous diabase dikes which parallel the fault structure.

2.14 Economic Geology. Outwash deposits of the Quinnipiac Valley provide a source of washed and graded aggregate primarily used as a source of concrete materials. Smaller pits opened in other ice-contact stratified drift deposits generally have a sporadic operation due to a wide range of grain size and unwanted silt layers.

2.15 Large quarries on the trap rock formations north of the Triassic border fault provide extensive trap rock products for use in concrete, road paving, ballast protection stone, and other uses.

2.16 Ground Water. Stratified drift deposits constitute potential sources of ground water for domestic use or for small industrial plants. Due to the high permeability of these formations, the water tables are generally low and closely adjusted to the nearest surface stream. Development of a reliable water supply from such aquifers is therefore highly dependent on thickness of sediments in the zone below the water table at the particular site. Till is generally too thin and in some places too impermeable to be a source of water other than for shallow wells of low yield. Most users of water in the Branford area derive their supplies either from surface reservoirs of from wells drilled in bedrock.

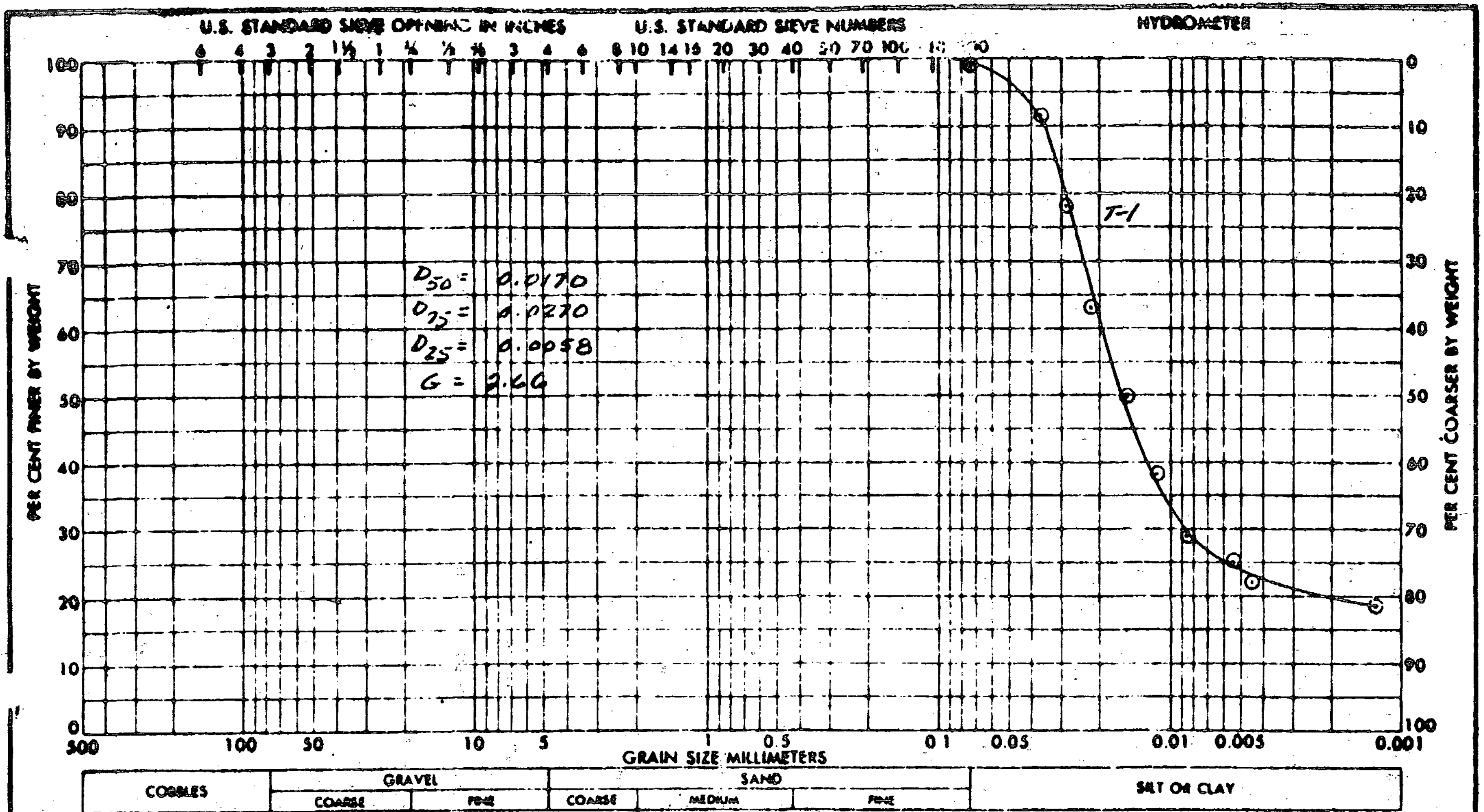
2.17 <u>Soil Sediments</u>. Coastal zones are dynamic environments with significant changes occurring coincidental with major storm events. Within the last 20,000 years New England has changed from a land dominated by a continental glacier to its present form. Since the retreat of the last glacier to the present time, the sea level has been rising. However, during the last 3,000 years, the rate of sea level rise has slowed to 0.3 ft/100 years (Hill and Shearin, 1970).

2.18 The initial hydrographic survey was conducted in December 1968 in preparation for approving the area for a Federal channel. The most recent survey in April 1974 has shown a reduction in channel depth in the northern end of the project since it was initially dredged.

2.19 Sediment analysis for several physical characteristics and heavy metals were conducted for Stony Creek. The Corps of Engineers sampled three locations in the project channel and maneuvering basin. Samples were collected in July 1975 and analysis has shown that sediments are generally described as black organic silt with characteristic marine odors.

2.20 Analysis revealed fine particle content classified as "organic silt" at the head of the project. The outer station nearest Long Island Sound, where shoaling has not been as significant, contained sediments that were not as fine and were classified as "fine" sandy organic silt. Grain size - gradation curves are presented.

2.21 The results of heavy metal testing did not indicate any high levels. Extensive testing was not warranted and detailed statistical analysis of the heavy metal data was not applied since the number of samples was small. The similarity of Stony Creek to other Connecticut



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
T-1	0.0'-1.85'	ORGANIC SILT (OH)		77	36	41
			**	(60)	(39)	(21)
		** Test performed on Oven-dried Soil				

PROJECT Stony Creek, Branford, Conn.

AREA

BORING NO PE-1 (Lab. Ser. No. 100-207-1)

DATE February 1976

GRADATION CURVES

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1261, SEP 1962, WHICH IS OBSOLETE.

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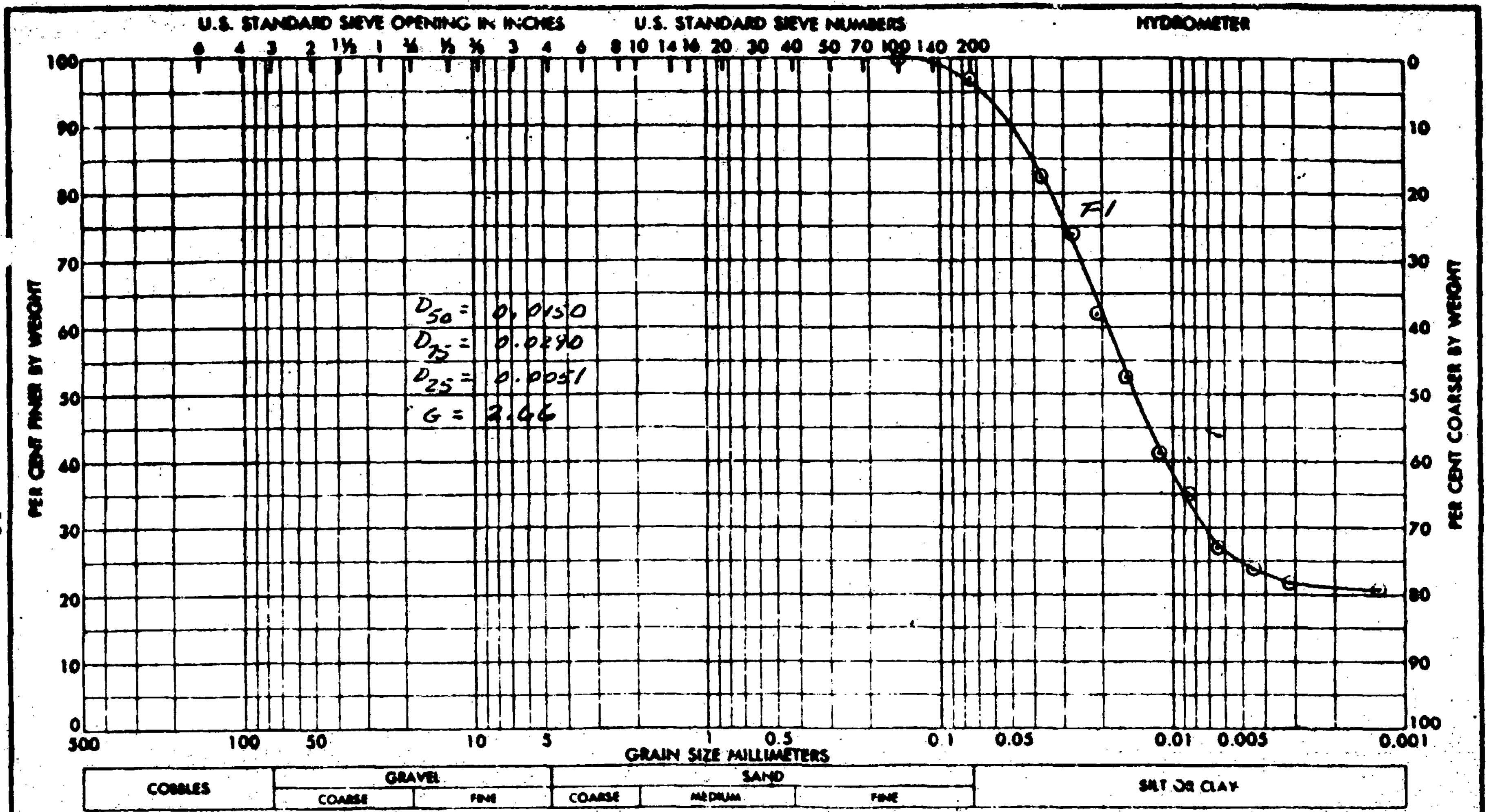

SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
T-1	0.0'-1.80'	ORGANIC SILT (OH)		69	36	33

PROJECT Stony Creek, Branford, Conn.

AREA

BORING NO. PE-2 (Lab. Ser. No. 100-207-2)

DATE February 1976

GRADATION CURVES

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

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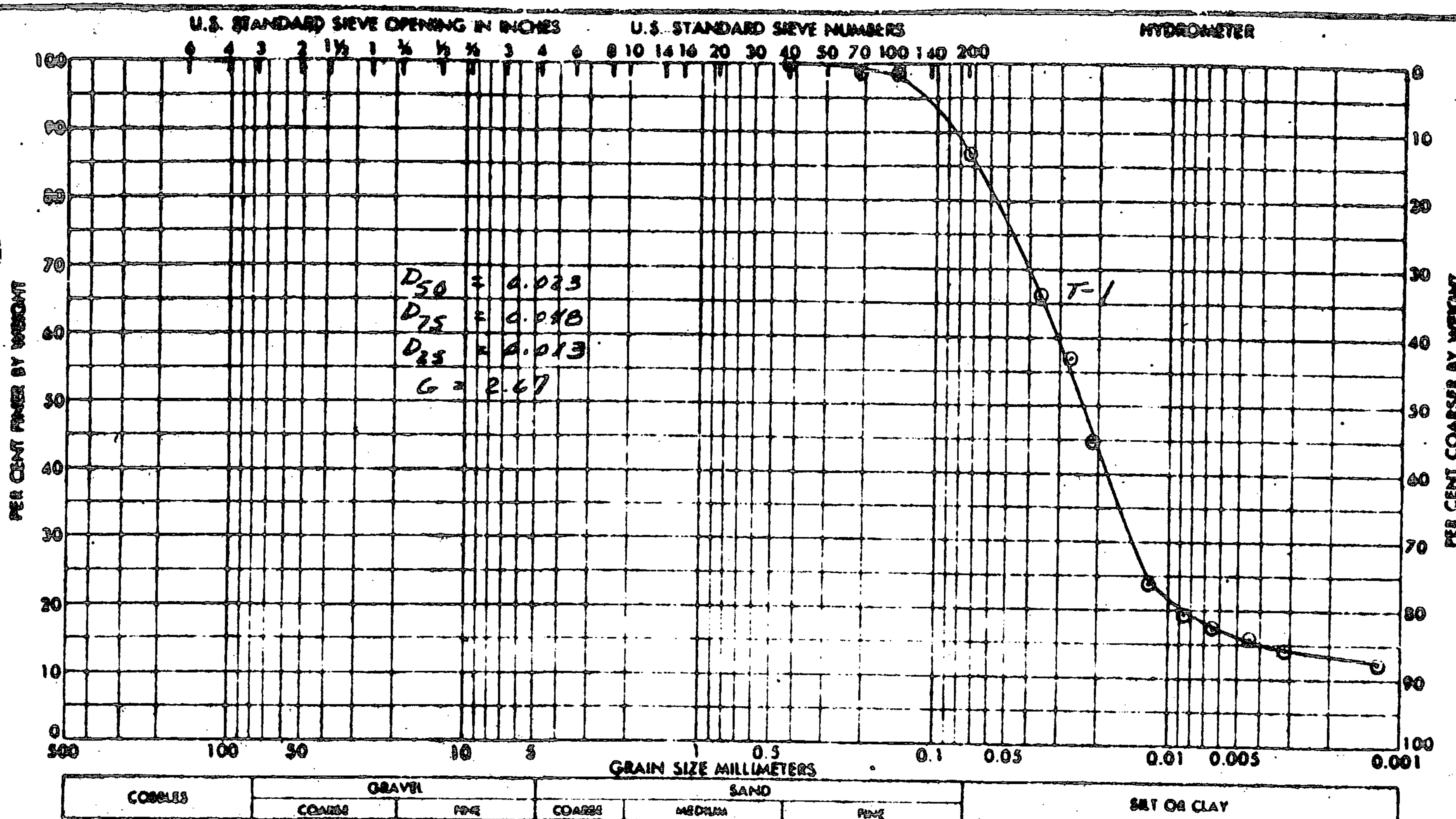

SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
T-1	0.0'-1.5'	Fine-sandy ORGANIC SILT (OL)		49	32	17

PROJECT Stony Creek, Branford, Conn.

AREA

BORING NO PE-3 (Lab. Ser. No. 100-207-3)

DATE February 1976

GRADATION CURVES

ENG FORM 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

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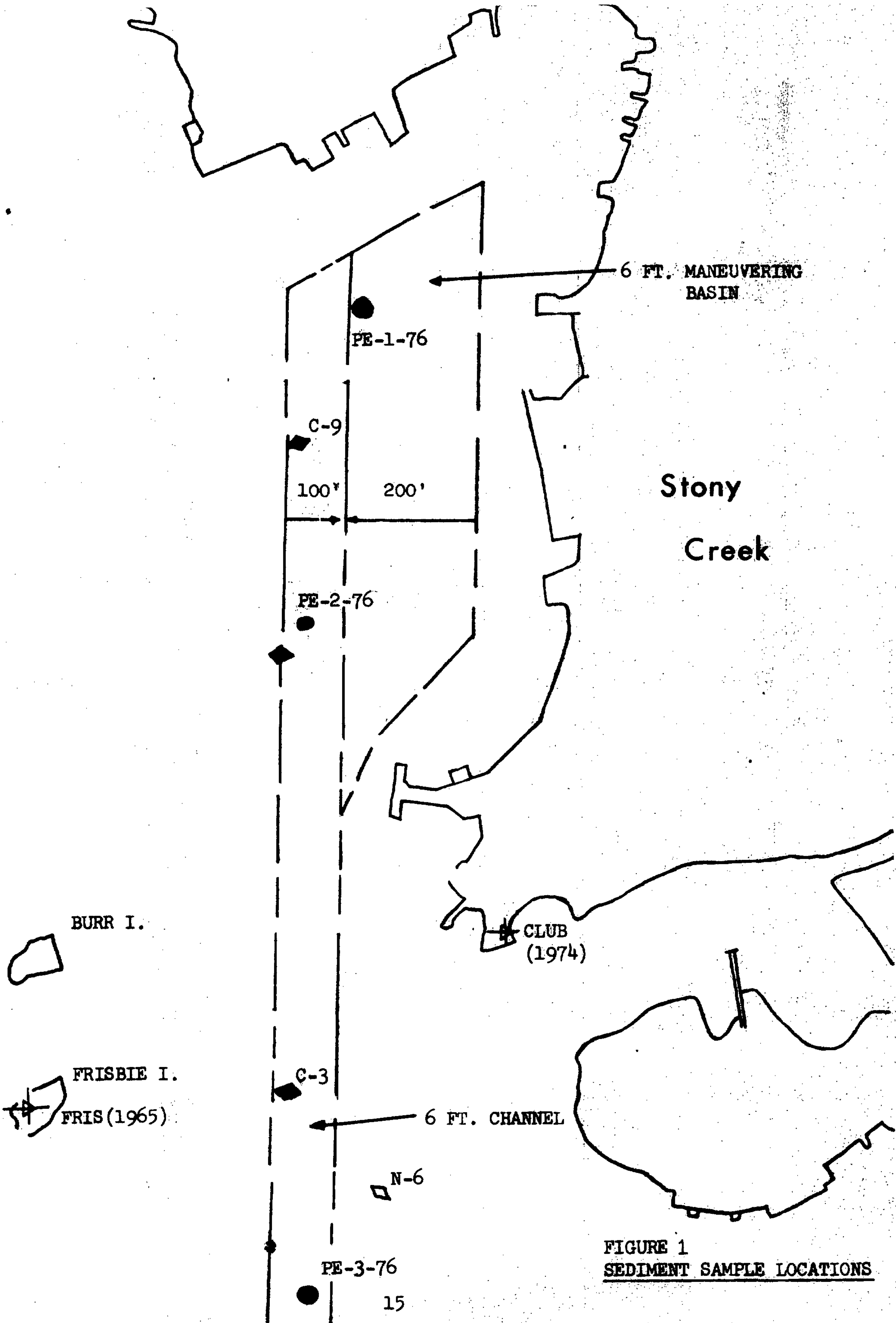

FIGURE 1
SEDIMENT SAMPLE LOCATIONS

harbors can be made with table 1 and 2 on the following pages.

2.22 Climatology. The Stony Creek area characteristically has a variable climate. The area lies in the path of the prevailing "westerlies" which generally travel across the country in an easterly or northeasterly direction producing frequent weather changes.

2.23 Temperature. The average annual temperature of Branford is about 50° Fahrenheit. Extremes in temperature range from occasional highs in excess of 100° F to lows recorded at less than -10°F. Freezing temperatures may be expected from the latter part of October until the middle of April.

Table 1: Summary of Concentrations of Heavy Metals and Arsenic for Stony Creek Project Sediments

	Mean, ± std. dev. (%x10^{-3})	Range (%x10^{-3})
Mercury, Hg*	2.43 ± 1.39*	1.10 - 4.70*
Lead	4.97 ± 1.39	3.60 - 6.60
Zinc	16.00 ± 5.17	12.60 - 26.40
Arsenic	0.52 ± 0.12	0.38 - 0.67
Cadmium	0.18 ± 0.08	0.10 - 0.25
Chromium	6.10 ± 3.81	3.50 - 13.40
Copper	8.53 ± 3.25	6.10 - 14.70
Nickel	3.85 ± 0.69	3.10 - 5.00
Vanadium	6.22 ± 2.35	3.10 - 10.10

* Hg in % x 10^{-5}

TABLE 2

CONCENTRATIONS OF HEAVY METALS IN SEDIMENTS IN CONNECTICUT HARBORS
(% 10-3)

HARBOR	MERCURY* HG	LEAD PB	ZINC ZN	ARSENIC AS	CADMIUM CD	CHROMIUM CR	COPPER CU	NICKEL NI	VANADIUM V
BRANFORD HARBOR 1972	3.34±1.20 1.70-5.90	10.44±4.49 3.92-19.64	67.58±35.80 19.93-150.77	2.74±1.33 .53-5.89	.25±.09 .14-.49	20.73±15.01 3.09-59.18	24.54±12.72 9.35-56.23	4.11±1.16 2.06-6.38	7.53±3.05 3.26-15.96
1974	7.15±1.88 3.60-10.00	8.69±2.94 3.60-12.80	33.78±17.80 4.30-69.10	.81±.50 .13-1.70	.24±.08 .14-.470	15.73±9.57 3.60-34.50	19.88±12.01 2.20-43.90	5.06±1.30 3.20-8.40	9.12±2.74 4.80-15.80
NEW HAVEN	3.40 .1-9.9	8.81 .47-62.2	25.24 1.4-100				17.14 .90-52.1		
WEST RIVER	17.27 5.0-31.0	30.63 7.56-82.70	51.20 10.18-78.64		1.03 .5-1.34	24.43 6.31-34.18			
MILFORD	2.16±1.63 .50-4.60	11.87±8.06 1.38-21.21	24.85±16.20 3.58-40.17	1.37±.56 .42-2.14	.33±.20 .10-.56	10.99±7.09 .82-20.59	20.90±12.94 2.81-35.25	4.42±2.39 .92-7.03	3.99±2.44 1.02-7.17
HOUSATONIC	1.27±1.28 .10-5.20	3.76±4.43 .57-15.18	21.60±26.95 .27-116.39				32.034±52.66 1.21-235.83		
NEW LONDON	.98±.81 .20-3.30	2.60±2.00 .63-9.05	5.79±2.08 2.99-11.13				2.64±1.49 .94-9.23		
NORWALK	22.85 1.7-53.9	30.93±43.69 5.14-220.44	46.01±25.76 9.34-140.28		.45±.16 .18-.64	13.92±5.53 2.07-21.21	27.14±15.41 3.86-85.51		
STAMFORD	12.09±9.41 2.0-41.0	51.55±51.25 4.0-162.0	70.92±52.02 8.0-167.0						
GUILFORD	3.06±1.46 .3-4.7	5.64±2.55 .44-9.49	17.94±7.66 1.43-29.41		.17±.15 .03-.59	11.31±17.27 .10-74.84	10.83±4.98 .74-17.08		

* % x10-5

NOTES: VALUES SHOWN ARE PERCENT OF SAMPLE'S DRY WEIGHT, AND ALL TESTS ARE PERFORMED IN ACCORDANCE WITH EPA "CHEMISTRY LABORATORY MANUAL," UNLESS OTHERWISE NOTED.

VALUES REPORTED INCLUDE MEAN, RANGE AND STANDARD DEVIATION FOR MOST HARBORS.

2.24 Precipitation. The mean annual precipitation is about 46 inches. Distribution of precipitation is approximately uniform throughout the year although short periods of heavy precipitation are frequent.

2.25 Snowfall. The average annual snowfall in Branford is about 36 inches, although less snowfall occurs near the coast.

2.26 Storms. The rapidly moving cyclonic storms or lows that move into New England from the west or southwest produce frequent periods of unsettled, but not extremely severe weather. The region is also exposed to occasional coastal storms, some of tropical origin, that travel up the Atlantic coast and move over or within striking distance of the New England States. The most severe storms have been of tropical origin (hurricanes) which occur during late summer and early autumn. Four notable storms which affected the Stony Creek area occurred in September 1938, September 1944, November 1950 and August 1954.

2.27 Tidal Information. In Long Island Sound the height of each tide varies during the lunar month, and the time interval for a complete tide cycle averages about 12 hours, 25 minutes. This results in the daily occurrence of two low and two high tides on an average of six out of seven days. Basic tide data at Stony Creek Harbor is listed in Table 3 with a datum of mean low water (mlw).

2.28 The mean range of tide in the vicinity of Stony Creek is 5.6 feet. The spring range is 6.5 feet. The lowest tide to be expected is minus 2.5 feet mean low water. The locality is shown on United States Coast and Geodetic Survey Charts Nos. 217 and 1212.

Table 3: Tide Data, Stony Creek Harbor, Connecticut

(In Feet)

Mean Tide Range	5.6
Average Spring Tide Range	6.5
Mean High Water (Above mlw)	5.6
Mean Spring High Water (above mlw)	6.2
Mean Sea Level (above mlw)	2.7
Mean Low Water	0.0

2.29 <u>Historical and Storm Tides</u>. The maximum tidal elevations in Stony Creek Harbor have occurred as a result of hurricanes. Based on historical accounts, the greatest tidal level prior to 1900 occurred on 23 September 1819 and 24 August 1893 when tides reaches an elevation of 9.5 mean sea level. In the last 36 years Stony Creek Harbor has been subjected to extreme tides from three major hurricanes and one severe storm, namely the hurricanes of September 1938 and 1944, August 1954, and the storm of November 1950. Estimated tidal heights for these events are listed in Table 4. These elevations are estimated on high watermarks in Branford and Bridgeport areas.

Table 4: Abnormal Tide Data, Stony Creek Harbor, Connecticut

Date	Elevation (ft. msl)
21 September 1938	9.5
31 August 1954	9.5
14 September 1944	8.8
7 November 1950	8.8

2.30 Continuous records of tidal elevations are not available for Stony Creek. Estimated frequencies of abnormally high tides have been determined based on high water marks in the Branford and Bridgeport Harbors.

2.31 Frequency of High Tides. Continuous records of tidal elevations are not available for Stony Creek Harbor. Estimated frequencies of abnormally high tides have been determined from high watermarks and are shown in Table 5.

Table 5: Estimated Frequency of Abnormally High Tides, Stony Creek Harbor, Connecticut

Frequency (years)	Elevation (ft. msl)
10	8.4
50	10.5
100	11.7
Standard Project Hurricane	15.5*

*Figures are representative of the most severe combination of meterological conditions that is considered reasonably characteristic of the region.

2.32 Water Quality. The adopted water quality standard of the State of Connecticut for Stony Creek Harbor is an SB classification. The present water quality for "Tidal waters inside Thimble Islands - Stony Creek, Branford Shellfish Closure Line" meets this adopted standard. The SB classification pertains to coastal and marine waters suitable for recreational purposes including bathing, industrial cooling, shellfish harvesting for human consumption after depuration, excellent fish and wildlife habitat, and good aesthetic value. Long Island Sound waters outside the closure are classified as SA.

2.33 Shellfish closings have become a common occurrence along coastal areas. High counts of coliform bacteria is a criteria for closure. The Connecticut State Department of Health has described the shellfish closure area around Stony Creek as "that area enclosed by a line extending from Brown Point light in a southeasterly direction to the southern extremity of Outer Island, thence in a northeasterly direction to the western extremity of Narrows Island, thence due north to the mainland at Leetes' Island, seasonally between May 1 and September 30."

2.34 The water quality classification is defined on the following characteristics: dissolved oxygen, sludge deposits, silt or sand deposits, color and turbidity, coliform bacteria, taste and odor, pH, temperature, and chemical constituents.

2.35 The criteria are based on uses of the aquatic resource. Such categories as recreation and aesthetics, public water supply, aquatic life and other wildlife, agriculture, and industry are basic intended uses. See Appendix A.

2.36 No data exists for heavy metal analysis from waters in Stony Creek harbor. Samples, however, were taken from nearby Branford Harbor on December 13, 1974, during a study prior to maintenance dredging of that project. For comparative purposes only these results are presented along with average concentrations found in seawater and concentrations having toxic effects on marine life, see Appendix A.

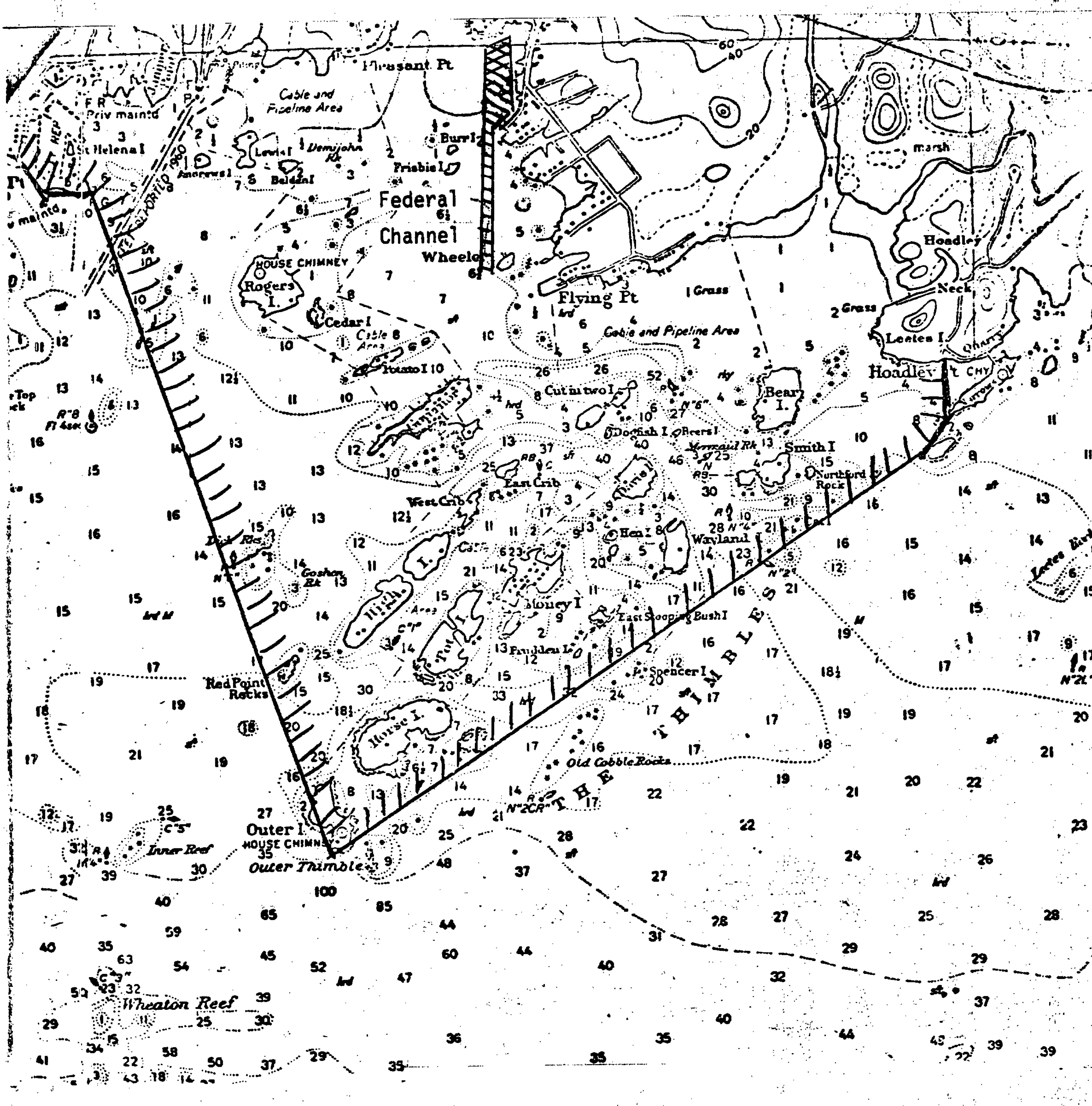

Figure 2: Shellfish Closure Area
Between May 1 and September 30

2.37 It is expected that the harbor waters surrounding Stony Creek would contain lower concentrations of all metals than would the Branford waters, because the population and industry is very light in the Stony Creek area. Comparison of metal analysis of the sediment in respective harbors would indicate that Stony Creek waters contain comparatively low levels of metals.

2.38 Ecological Description. Stony Creek is typical of the Connecticut coast along Long Island Sound. Connecticut is also representative of New England in general. The nearest local area to Stony Creek that has recently been described fully is the Branford Harbor area. A presentation of that information is offered here and it represents a similar picture of the Stony Creek area.

2.39 The important biomes (life zones) in the area include the Eastern Deciduous Forest and Northern Hardwood - Coniferous Forest.

2.40 Botanical Elements. The vegetation in the Branford Harbor area is typical of the general Appalachian Oak Forest Association found on the north shore of Long Island Sound. The oak-dominated system includes scarlet oak (*Quercus cossinea*), northern red oak (*Quercus borealis*), white oak (*Quercus alba*), and beech (*Fagus grandifolia*). The disturbed areas contain associations in various stages of succession.

2.41 Wetlands along the small bays and rivers off Long Island Sound consist of saline marshes at the bay-edge, grading to less saline vegetation at higher elevations. Typical marsh plants include salt water cordgrass (*Spartina alterniflora*), salt meadow hay (*S. patens*), spikegrass (Distichlis spicata), and blackgrass (Juncus gerardi). Wetlands in the Stony Creek area are shown in Figure 3. Significant wetland areas exist primarily to the north in the tidal influence of Stony Creek, and along the creek between Pleasant Point and Juniper Point. A very small area also lies just to the east of the project where it feeds into the harbor through a culvert under Thimble Islands Road. Local concern and state laws provide considerable protection to retain the existing wetlands.

2.42 A list of common plant species identified from sites around the Branford Harbor area, and similar to Stony Creek harbor area, is presented in Appendix B.

2.43 Plankton. The Connecticut Department of Environmental Protection Biological Monitoring Program has a sampling station (#28) in Branford Harbor. Data from this station includes identification and relative abundance of the plankton community in the harbor. Those data and information on other aquatic organisms can be found in Appendix C.

2.44 Riley (1973) conducted a study of zooplankton in Branford Harbor. Results show peak abundance of the Calanoid copepod Acartia clausi occuring on June 21 with concentrations on the order of 10,000 to 100,000 individuals per cubic meter, and its subsequent decline and replacement by Acartia tonsa with concentrations on the order of 10,000 individuals per cubic meter, occurring in late July (end of sampling period). Temperature is considered the most important factor in this seasonal replacement. In addition, polychaete larvae

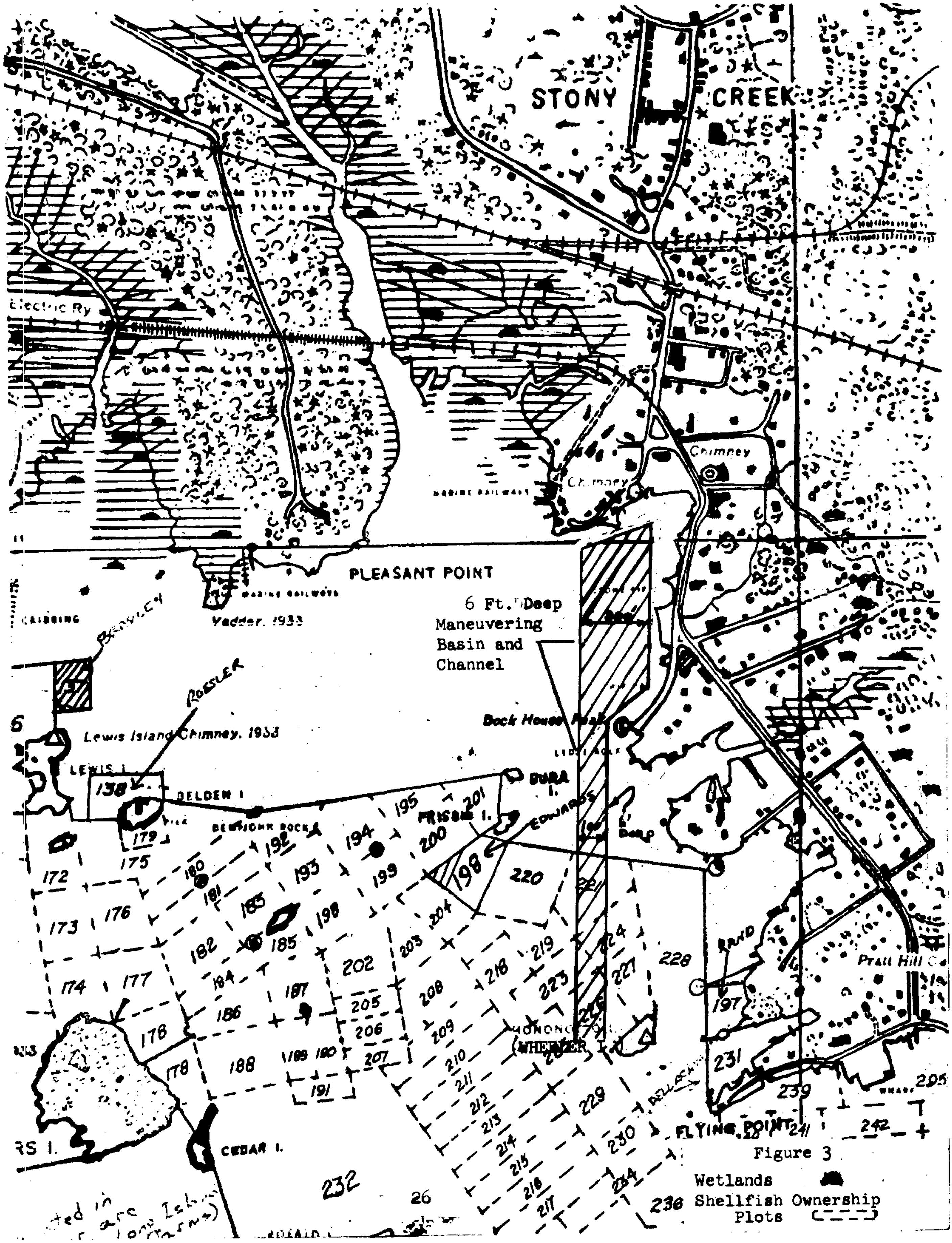

Figure 3

Wetlands

Shellfish Ownership Plots

with concentrations on the order of 1,000 to 10,000 individuals per cubic meter occurred throughout the sampling period with a gradual seasonal increase. Other zooplankton reported by Riley (1973) include trochophores, nematodes, gastropod larvae, lamellibranch larbea, foraminifera, tunicate larvae, echinoderm bipinnaria, tornaria larvae, medusae, fish eggs, and crab zoea.

2.45 Invertebrates. Samples from Stony Creek Harbor have not been taken, but studies from Branford Harbor and New Haven Harbors provide applicable information. These data are contained in the environmental reports for those projects and in Appendix D. Though quantified information was provided the data was considered qualitative. It was evident from the samples taken that the benthic infauna could be described essentially as an Ampelisca community. Characteristics of such communities have been described by Pratt (1973), and are also included in the Appendix.

2.46 Historically, Stony Creek Harbor has supported a considerable oyster fishery. A map depicting shellfish ownership plots along the harbor bottom is shown in Figure 3. Oyster plots are privately owned within the Thimble Islands. The Long Island Oyster Farm Company, of New Haven, Connecticut, owns the majority of plots around Rogers Island, Burr and Friskie Islands.

2.47 The head of the harbor, where Stony Creek enters the harbor, has been used for seeding operations. Spat, or newly set oysters, are taken from the area and deposited in other areas for growth and harvesting.

2.48 In the past few years commercial oystering in the area has been minimal. Some private local oystering still remains at the head of the harbor during the open season.

2.49 Invertebrates from Branford Harbor have been preliminarily compared for heavy metal content with those from the Thames River and the western end of Long Island Sound. The Marine Sciences Institute, University of Connecticut, has shown that Branford's invertebrates contain less or similar amounts of zinc, mercury, lead, cadmium, copper, and manganese. Nickel is higher is comparison. Mercury is in lower concentrations than EPA standards.

2.50 It is reasonable to assume that invertebrates from the Stony Creek Harbor would have similar or lower metals content than those from Branford Harbor. Though it would not be conclusive, sediment comparisons would indicate this. Stony Creek has no serious industrial pollution along its course.

2.51 Zoological - Fishery. Over 100 species of finfish are found in the waters of Long Island Sound and its bays and estuaries. Appendix E lists 49 of the most common species. In addition, the appendix contains a listing of finfish and macroinvertebrates found in nearby New Haven Harbor.

2.52 Sampling was conducted in summer of 1975 in Branford Harbor. Species caught in the river channel were summer flounder (Pseudopleuronectes americanus), Atlantic herring (Clupea Harengus), red hake (Urophycis Chuss), cunner (Tautogolabrus adspersus), and immature and adult bluefish (Pomatomus saltatrix).

2.53 Due to the high concentrations of plankton, bottom fauna, and forage fishes, Long Island Sound is used as a spawning and rearing area by many species of fish (Long Island Sound Regional Study 1974). The Atlantic mackerel (*Scomber scombrus*), and fish in the herring family are found in the area as juveniles and as adults. As an example, menhaden (*Brevoortia tyrannis*) enter Long Island Sound during May and remain through September. The adults spawn at the ends of the Sound and the larvae migrate to the safer, shallower estuarine waters. Thus, the menhaden, which is of commercial value for fertilizer and poultry feed (Thompson and others, 1971), uses the Sound as both a migration route and a nursery area. This is only one example of the general importance of Long Island Sound and its bordering wetlands to the life cycle of fish with commercial value.

2.54 Sport Fishing. Sport Fishing in the Long Island Sound region is a $13 million annual resource and is increasing. About 85 percent of the total is estimated to be salt-water fishing. The State of Connecticut alone has an estimated 340,000 salt-water fishermen in 1970. Branford Harbor is the home base of some of these fishermen, having 1,075 vessels operating out of its marinas and yacht clubs. An additional 200 boats are moored at Stony Creek Harbor, many of which are used for sport fishing. The harbor is also a refuge for long sport fishing cruises, and its marinas supply needed fuel and repairs for home and transient boats.

2.55 Primary salt-water sport fish include the striped bass (Morone saxatilis), bluefish, winter flounder, summer flounder, Atlantic mackerel, tautog (Tautoga onitis), and scup (Stenotomus chrysops). Lobster (Homarus americanus) clams, oysters (Crassostrea virginica), and blue crabs (Callinectes sapidus) are also taken. See Appendix E for list of regional fish that can be expected to be found in the area.

2.56 Commercial Fishing. Commercial fishing, once a major industry in Long Island Sound, has declined over the years and now contributes to less than 10 percent of the consumption in the Sound area. Commercial activities in Branford are limited to off-loading shellfish at facilities in the harbor. There are approximately 10 fishing, 3 lobster, and 2 oyster boats operating out of Branford Harbor. The total catch for all commercial species amounted to 77 tons for the same period. Commercial species most sought after include shad (Alosa sapidissima), flounder, scup, menhaden, striped bass, bluefish, Atlantic mackerel, and tautog. Lobster, clams, oysters, crabs, and mussels are also commercially important.

2.57 There are seven commercial fisherman operating out of Stony Creek Harbor. Lobsters are the perdominant harvest. Lobster grounds are primarily in the outer Thimble Islands area where the rocky bottom offers a suitable habitat.

2.58 Commercial Use of the Harbor. Other than recreational craft, and commuting boats during the summer months, the harbor provides shelter and livelihood for several commercial concerns. Operating out of Stony Creek harbor are seven commercial fishermen, two marine contractors, utility tradesmen for work on Thimble Island homes, an active ferry service to the Thimble Islands, three sight seeing enterprises and several marinas and marine services.

2.59 In this past year the Town of Branford has upgraded and repaired the town dock for additional large boat space. The Town also installed new floats to be rented for commercial boat use.

2.60 The Branford Harbormaster has described a high demand and necessity for new marinas for the area. Private waterfront property and wetland preservation has kept strict control on new marina growth. Parking area location becomes a significant problem.

2.61 Stake moorings and finger-pier space in the harbor are fully utilized. Additional area is available with the use of mushroom type moorings. These types of moorings are considered risky for the harbor. Moderately high seas generated by southwest winds have little trouble in dislodging moorings in the shallow waters.

2.62 <u>Atlantic Flyway</u>. The Atlantic Flyway is an area covering 446,000 square miles and contains about one-third of the human population of the United States (Addy, 1964). The Branford area is located in the northern portion of the flyway and is situated in subregion 3 of the flyway which contains 6,000 acres of wetland habitat suitable to waterfowl (Long Island Sound Regional Study, 1974). Since flyways are composed of many corridors (Bellrose, 1968), the majority of the waterfowl enter the Atlantic Flyway south of Connecticut through New York and fly south to winter in Chesapeake Bay or the Carolinas (Addy, 1964).

2.63 Migrating Waterfowl. The major migration route for Connecticut is an extreme eastern corridor that follows roughly the New England coast (Bellrose,1968; Kortright, 1942). Important ducks harvested along the flyway include black ducks (*Anes rubripes*), wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), green-winged teal (*A. carolinesis*), and wigeon (*Mareca americana*) (Addy, 1964). American brant (*Branta bernicla*), Canada geese (*B. canadensis*), white-winged scooter (*Melanitta deglandi*), black scooter (*Oidema nigra*), and black duck are the species most abundant as migrants along the coast (Sanderson and Bellrose, 1969). The difference between the bird abundance and harvest is hunter-selection.

2.64 This area of Long Island Sound is an important wintering ground for the following avian fauna: horned grebe (*Podiceps auritus*), pied-billed grebe (*Podilymbus podiceps*), green-winged teal, American wigeon, greater scaup (*Aythya marila*), common goldeneye (*Bucephala clangula*), buffle head (*B. albeola*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser*), and American coot (*Fulica americana*). Permanent residents include great blue herons (*Ardea herodias*), black-crowned night herons (*Nycticorax*), mute swans (*Cygnus olor*), Canada geese, mallards, black ducks, killdear (*Charadrius vociferus*), clapper rails (*Rallus Longirostris*), great-black-backed gulls (*Larus marinas*), herring bulls (*L. argentatus*), and ring-billed gulls (*L. delawarensis*).

2.65 Rare and Endangered Species. A review was made of the Federal Register lists of Endangered and Threatened Wildlife Species published on June 16, 1976 and October 27, 1976. No rare and endangered birds, plants or animals are expected to be affected by this maintenance dredge project.

2.66 Aesthetic Elements. Stony Creek harbor is outlined by small New England type communities and marshes. The coast line within the village limits of Stony Creek is well developed with small commercial concerns and private property. Further description will not be made since maintenance dredging will not impact on the aesthetic characteristics of the area.

2.67 Cultural Resources - Archeological and Historical. The nature of maintenance dredging precludes the discovery of archaeological or historical elements in an undisturbed state. The dredging will be of those sediments that have settled into a previously dredged area. There will be no new dredging that would effect undisturbed sediments below maintenance depth or increased channel width.

2.68 Disposal Area. The proposed disposal site is the New Haven Disposal Area. The area is located south of New Haven harbor where its center is located at approximately $41^{o}08'56''$N and $72^{o}52'54''$W. The The disposal area is generally 60 feet to 70 feet deep (mean low water datum). Recent bathymetric surveys by Yale University (by H.J. Bokuniewicz, J.A. Gebert, R.B. Gordon, and others, 1976) shows the disposal area gently sloping upwards in a southeast direction. The bathymetry reveals a pile of previously disposed dredged material with approximately a 400-600 meter radius and rising about 7 meters above the marine floor.

2.69 Considerable information exists from studies conducted at the disposal site. Physical, chemical and biological characteristics have been reviewed. The release of dredged material and its subsequent behavior in the water column and along the sea floor have been studied. Such information is available and for an in-depth review the reader should refer to those studies. Several of these studies are entered in the list of references.

2.70 The site location is characterized primarily by those sediments disposed after dredging of New Haven and Guilford Harbors, Connecticut, in 1974.

2.71 Sampling at the site in 1974 revealed the area as being "practically devoid of molluscs", (Rhodes, Aug. 1974). It appeared at that time that dumping did not heavily impact the area since previous studies had indicated low mollusc populations, (Rhodes, January and July 1973). Benthic life under the disposal pile was eliminated after the dumping (New Haven Harbor quantity, 945,000 cubic yards, Guilford Harbor quantity, 72,000 cubic yards).

2.72 Since the last disposal, recolonization has significantly taken place. New colonies of tubiculous polychaetes, especially _Capitella capitata_, and meiofaunal activity (_amphipod_ and _ostracodis_) quickly increased after dumping.

2.73 Some bivalve repopulation was occuring with such species as _Nucula annulata_, _Pitar morrhuana_, and _Yoldia limatula_. Also present were _Tellina goilis_, _Peziploma popyratium_ and _Lyonsia hyalina_. Colonizing gastropods were represented by _Nassarius trivittatus_, _Retusa Polinices_ sp., and _Turbonilla_ sp.

2.74 It did appear that if colonization were to continue, then the disposal would have "little effect on the demography of the benthos samples", (Rhoads, September 1974). Population densities and diversities had reached levels approximating areas outside the disposal site within five months (Bokuniewicz, Gerbert, Gordon and others, June 1976).

2.75 Detailed descriptions of the site prior to the past disposal have been presented previously in earlier reports. Site references have been presented in the reference listing.

2.76 With certain consideration of disposal time, pile height and quantities released, the latest report reviewing the New Haven Harbor Disposal Area characteristics maintains "that the site is a suitable environment for the deposition and containment of silt", (Bokuniewicz, Gebert, Gordon and others, June 1976).

2.77 For the small quantity of material to be disposed at this site, significant impacts to lobster and fishery resources is not expected. An analyses of these resources will not be presented here. Such information is available in previously cited work.

3.00 RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS

3.01 The proposed maintenance dredging will not alter the present use of lands surrounding the harbor. These lands are regulated by local ordinances and have been primarily committed to private use and enterprises. The wetlands are regulated by the State of Connecticut's wetland law and local conservation organizations. There will be no conflict with existing or proposed land use plans in the area.

The harbor is the primary characteristic feature of the village of Stony Creek. It provides the area with its prime recreational resource and is the area's major attraction. Many livelihoods and Thimble Islands services are dependent on the use of the harbor.

4.00 PROBABLE IMPACT OF THE PROPOSED ACTION

4.01 The most significant impact of the proposed maintenance project would be the improvement of navigation conditions in the channel and maneuvering basin. This would afford safe passage for all the vessels using the harbor. In addition, vessels seeking refuge within the harbor would be able to rely on the charted depth without fear of hazardous groundings.

4.02 Channel improvements will aid the commercial and sport fishing boats and the island ferry by helping to prevent damages from running aground. During the lower stages of the tide, vessel operation in the harbor is hazardous and the ferries have had considerable difficulty in reaching the Town Wharf. It has been necessary for the ferries to shift weight to keep the propellers free spinning. Costly engine repairs and propeller replacements have been necessary. Dredging would maintain access to the shore facilities at Stony Creek village for most of the vessels now using the Thimble Islands anchorages and waterways. Improvements will enable continued use of the boat launching ramp, the Town Wharf, and the public boat livery service.

4.03 Stony Creek is characteristically a boating harbor. The channel remains an important recreational and livery asset to the village and the islands. The harbor has long been recognized as a "safe" and protected harbor for transient boats crossing Long Island Sound. Should recreational boating, sport fishing, or commercial livery use be curtailed, the town would have few options for developing and maintaining marine facilities. Periodic maintenance dredging is essential to recreational boating in Stony Creek at its present level.

4.04 Direct and indirect impacts on water quality and estuarine biota can be expected as a result of maintenance dredging. Dredging will remove and alter the benthic communities in and near those areas to be dredged. In the channel and maneuvering basin the obvious effect will be the destruction of organisms removed in the dredged material. This will primarily impact in the oyster grounds within the channel and basin limits. The majority of dredging will occur in the basin area.

4.05 Coordination with the major oyster bed owner, the Long Island Oyster Farm Company in New Haven, revealed that these beds are not normally harvested. Shellfish closure areas have precluded any harvesting due to pollution in the warmer months. The project area has considerable boat traffic which also makes it difficult to harvest in the area. Initial dredging of the project in 1970 has previously disturbed the project area.

4.06 For the initial dredging in 1970 when approximately 60,000 cubic yards of material were removed, the U.S. Fish and Wildlife Service reported on the probable effects of dredging on the areas fishing resource. The U.S.F.&W.S. reported in 1965, prior to shellfish ground closures, that the bucket and scow dredge "would not significantly affect fish and wildlife resources," (U.S.F&W.S. report to Corps of Engineers, June 1965).

4.07 Dredging Impacts. Water movement in the harbor is principally driven by tidal forces. Some fresh waters are introduced generally during spring thaws from any remnant snow cover or during periods of intense rainfall. Depths of the harbor are very shallow. Very little suspended material is expected to be carried away from the site. Settling height of the water column around the site is shallow and this will help facilitate rapid settling of disturbed sediments. The effects will be temporary and shortlived.

4.08 Some of the larger and more mobile benthic species will be able to avoid the action of the dredge. Resettling of the suspended solids may cause some smothering of benthic macroinvertebrates. This is dependent on the species involved, the quantity of material redeposited, and the species of the organism. Certain burrowing benthic organisms can endure heavy siltation where other species are less tolerant. Generally, the benthos in an estuarine environment, such as Stony Creeks upper harbor, and as in shallow embayments of the area are well adapted to tolerate considerable changes in their environment.

4.09 The direct effect on fish populations will be minor because most species can avoid the direct impact of the dredged operation. However, losses of eggs, larvae or juveniles of various fish species, both pelagic and demersal types, are likely at certain times of the year. Losses would be the result of smothering or the physcial action of the dredge.

4.10 Estuarine fauna are able to tolerate rather high concentrations of suspended sediments for short periods. The shallow depths of the water and the small quantity to be dredged will keep the affects temporary and short lived. In an extensive literature review, Sherk and Cronin (1970) found high levels of salt tolerance in bivalves. Macklin (1961) studied the effects of hydraulic dredging operations on oysters and found no measurable effect unless the animals were actually buried.

4.11 Loosanoff (1961, 1965) found adverse effects on the pumping efficiency and shell movements of adult oysters and quahogs caused by 100-200 (ppm) of suspended material. He also observed a 69% mortality of oyster eggs held in 500 ppm suspended material. At 1000-2000 ppm virtually no eggs developed to the straight-hinge larval stage. Oyster larvae exposed to 3000-4000 ppm suspensions of silt did not survive to the beginning development of the settling stage. Rogers (1969) investigated the effects of suspended solids on four species of estuarine fish. Twenty-four hour median tolerance limits ranged from 50,000 to 300,000 ppm. Herbert and Merkins (1961) exposed fish to a diatomaceous earth and kaolin mix and recorded an 80% mortality after 14 days at concentrations of 270 and 810 ppm. Lobsters have been exposed to suspended material concentrations up to 3,200 ppm. of estuarine silt and 900 ppm of polluted sediments for 24 hours without mortality, (Saila and others, 1968).

4.12 Overall study results indicate that substantial increases in turbidity over background levels of 500 JTU (Dept. of Interior, 1970) and 400 ppm (VanOsten, 1948) can affect the viability of fishes. Some species like winter flounder are capable of withstanding high turbidities better than others. Pelagic fishes would probably be less tolerant than benthic species, but these species should be able to avoid the affected area.

4.13 It can be concluded that short term exposure to suspended sediments at the levels expected around the dredge site will not cause any significant impact on large fauna. Changes in turbidity will be far too small and far too short a period to reduce light in the euphotic zone significantly in this shallow area. No significant impacts are expected to alter phytoplantaon distribution or effect fish movements. The ecological integrity and productivity of the area will not be permanently affected. Impacts will be temporary and short lived.

4.14 Caution will be taken to eliminate damage during the summer spawning and settling period by precluding dredging between June 1 to September 30. Communication with the Long Island Oyster Farm Company has indicated their willingness to remove any oyster set they considered valuable and in danger of loss near the dredging area.

4.15 Impacts to the area from sedimentation are considered to be less severe than those conditions that would be experienced during storm conditions or stiff southwest winds. Bottom sediments are vigorously suspended creating highly turbid conditions. The temporary and localized turbidity resulting from dredging will not be significantly greater than conditions due to natural influences.

4.16 Overall, sediment quality in Stony Creek Harbor appears to be similar to that of other harbors on the north shore of Long Island Sound. Although the organic content is fairly high, the harbor is typical of productive estuaries that received considerable amounts of organic material from tidal wetlands, and silt from shoreward moving bottom currents.

4.17 It should be noted that considerable controversy surrounds the use of bulk chemical analysis for evaluating dredged material. In essence, no definitive conclusions about impacts on water quality from either land disposal or open-water disposal can be drawn based on numerical results of the bulk chemical analysis for various parameters. The test does not give any indication of the chemical state of a substance or the extent to which it might be released under actual dredging and disposal conditions. In addition, the chemical composition of the interstitial water, which may also be of major concern in the case of land disposal, is not evaluated by the bulk analysis methods.

4.18 Despite the difficulties in interpreting the chemical analysis results in terms of probable water quality impacts, the data does show that no parameters tested are present at a level which would cause concern. Because of the absence of point source wastewater discharges in the Stony Creek area one would expect this to be the case.

4.19 Possible Effects of Heavy Metals. Estuarine sediments, which are usually fine-grained and highly organic, serve as a sink for a variety of heavy metals and other pollutants, resulting in accumulation of these substances. Trace metals are transported from water to sediments by chemical exchange processes, plankton, adsorption or detrital organic and inorganic particulates, and by precipitation of ions. The body of knowledge concerning the complex physical, chemical, and biological processes that control sediment-water interactions is insufficient to predict the fate of heavy metals in dredged material. There is some supporting evidence that heavy metals will not be released to the water column upon resuspension of anaerobic, sulfide-bearing sediments, but rather that metals are readily absorbed or precipitated as ferric oxides and ferrous sulfides (Turekian, 1973; Chen, and others, 1976). Work by Gustafson (1972), for example, showed a decrease in heavy metal concentrations upon mixing of sediments with water, suggesting that suspended sediment may tend to remove metals from solution by adsorption. Further research is clearly needed before site-specific conclusions can confidently be made regarding changes in heavy metal concentrations with dredging an disposal.

4.20 Many estuarine and marine organisms can accumulate heavy metals from extremely dilute concentrations in the surrounding water. Although a majority of the work on heavy metal accumulation has dealt with species that may be used for human consumption, concentration may occur at all steps in the food chain, including phytoplankton and zooplankton. Therefore, any increases in the biochemical availability of heavy metals, either in the water comumn or through greater exposure or sediments to deposit-feeding organisms, may lead to increased metal uptake. Pringel _et al._ (1968) illustrated the capabilities of three species of bivalve mollusks (_Mya arenaria_, _Crassostrea virginica_, and _Mercenaria mercenaria_) to concentrate various heavy metals against a concentration gradient. They found that generally for any given metal and experimental conditions, the uptake rate and tissue concentration level decreased for the three species in the order given above. The times of exposure, as well as environmental concentration of a metal and temperature, affected uptake and concentration.

4.21 As with most pollutants or environmental stresses, heavy metals are normally more damaging to early life stages than to adults of a species. Calabrese _et al._ (1974) working with oysters (C. virginica), evaluated the toxicity of various heavy metals to oyster embryos. A summary of results of their research, carried out at the National Marine Fisheries Service Biological Laboratory in Milford, Connecticut, is given in Table 5. The table indicates that oyster embryo survival is adversely affected at fairly low concentrations of mercury, copper and zinc. Such elements as arsenic and chromium appear to be considerably less toxic.

Table 5: LC_{50}* Concentrations of Heavy Metals for Oyster (C. virginica) Embryos, 24-48 Hour Exposure (Calabrese, 1974)

Most Toxic		Less Toxic		Relatively Nontoxic	
Metal	LC_{50} Conc. (ppm)	Metal	LC_{50} Conc. (ppm)	Metal	LC_{50} Conc. (ppm)
Mercury	0.0056	Nickel	1.18	Arsenic	7.5
Silver	0.0058	Lead	2.45	Chromium	10.3
Copper	0.103	Cadmium	3.80	Manganese	16.0
Zinc	0.31			Aluminum	7.5

*LC_{50} refers to the concentration of a substance that causes mortality in one-half of the test organisms in a specified time of exposure, in this case 24-48 hours.

If heavy metal concentrations should increase during dredging or disposal of dredged material, it is likely that mixing due to tidal action, current, and wind will aid the rapid dispersion and dilution of dissolved and suspended matter, reducing the possibility for prolonged build-up of contaminants in the water column. The shallow area surrounding the dredge site will considerably aid in the deposition of metal containing sediments. This will minimize contact in the water column. Depletion of heavy metals from shellfish tissue after exposure ceases has been shown to occur at a much slower rate than the initial uptake and concentration. For example, Cunningham and Tripp noted that total purification of adult oysters having average mercury concentrations of 28 mg/kg in their tissues was not achieved over a six-month cleansing period. Because organisms cannot quickly expel heavy metals that have accumulated, these substances will essentially remain in the food chain until the organism or successively higher organisms die.

4.22 Both types of dredges normally operate quite efficiently. Only a small portion of the dredged material escapes and is introduced into the water column. Larger volumes of sediment come into contact with water during hydraulic dredging. Generally, the effects on water quality and estuarine biota depends partially on the amounts of sediments that is suspended. Also the principal chemical water quality changes caused by dredging are associated largely with the effects of exposing anaerobic bottom sediments. Reduced chemical compounds will exert an immediate oxygen demand on the overlying waters while biological degradation of organic matter will also consume oxygen although at a slower rate. Therefore, some depletion of dissolved oxygen may be experienced in the harbor while maintenance dredging is underway. Since distrubances due to dredging will be limited to small bottom areas at any one time, natural circulation and mixing in the estuary as well as the inflow of good quality fresh water will tend to reduce the duration and severity of dissolved oxygen reductions. Some hydrogen sulfide gas will probably be liberated during dredging, possibly resulting in unpleasant odors. Such impacts will be temporary.

4.23 Sediment analysis of the materials to be dredged have been presented previously in Section 2.00. The data shows the project sediments to have among the lowest metal concentrations along the Connecticut shore. Suspension, intake, and biologic accumulation of dissolved metals, or metal containing sediments, is not expected to detrimentally affect the marine biota. The quantities of materials to be dredged are small, and the length of time to complete the project is short. Dredging will also be done outside of the oyster spawning periods, when significant effects might otherwise have occurred during the most rapid growing stages.

4.24 Disposal Site. Several references have described the New Haven Disposal Area and the impacts associated with the dumping of dredged material. Vigorous research has been performed to extensively study the impacts at the New Haven site. Information is detailed in the report cited in reference list.

4.25 The New Haven site is characteristic of others in central and western Long Island Sound (Bokuniewicz and others, 1976). It can be expected that short-term and long-term impacts can result from disposal of dredged material. Short-term impacts will primarily occur only during the period of active disposal. Impacts of disposal are qualitatively similar to those of the dredging operation. Similarly, effects on water quality, burial of benthic organisms, damage to marine biota from turbidity, and changes in water chemistry can be expected to occur at the disposal site.

4.26 Dredged materials totaling 1,017,000 cubic yards from channel maintenance projects in New Haven and Guilford have been disposed at the New Haven site. These materials eliminated benthic life under the disposal pile. However, benthic colonies had effectively recolonized the area within five months. Benthic populations and diversities reached levels similar to those outside of the disposal area (Bokuniewicz and others, June 1976).

4.27 Estimates have been made of the sediment loss and mobility after being released from a carrying scow. Upon initial release the sediments drop through the water column in a "jet"-like convective descent. When the sediments contact the bottom, the stream spreads radially outward in a cloud-like plume. "For the New Haven disposal, all of the material in the density surge, which accounted for 99% of the total scow content, settled within 130m of the impact point," (Bokuniewicz and others, June, 1976). It is likely, even with point discharge, that large movement around the disposal buoy could increase the depositional area to one with a 400m radius.

4.28 To minimize erosion, Bokuniewicz, et. al. (June, 1976) suggested that the mound height of the disposed material be less than three feet. A conical mound 400m in radius could then be expected to contain over 500,000 cubic yards of material. Depositional height is expected to be very small for the 28,000 cubic yards of sediment from Stony Creek harbor. If 1% of the volume (99% conveyed to bottom) of the dump goes into a surface layer cloud, this would result in a bottom layer build up of between 3.5 centimeters and 11.5 centimeters (1.4-4.5 inches). The New Haven site is considered a depositional area and accumulates silt at a rate of about $8gm/m^2$-year. Currents in the area are predominantly tidal in nature. Storm related effects may increase current velocities even though the depth is too great to be affected by wave action. Though the bottom readily accumulates silt resuspension of these sediments is frequent and may be the cause of high turbidities in the Sound. The silt bottom is resuspended to some extent every tidal cycle, but the site is considered a suitable environment for the deposition and containment of silt (Benninger, 1976; Bokuniewicz, 1976).

4.29 The sediments from the Stony Creek harbor are predominantly silts and clays and the top millimeter will be dispersed outside the site area. Minimal distraction of benthic life is expected since the bottom layer will be very thin. Bokuniewicz et. al. have found that biological workings of the sediment keeps the top 10 cm mobile in the Sound's waters. The depth of the disposed sediment is expected to be less than the mobile portion at any affected location.

4.30 A summary of the sediment analysis for New Haven Harbor and the disposal site prior to the New Haven dumping are shown in tables 6 and 7. In comparison, the Stony Creek harbor sediments have noticeably lower concentrations of heavy metals and arsenic than the New Haven Harbor sediments. The New Haven Harbor sediments predominantly comprise the present bottom at the dump site. Further comparison shows heavy metal levels of the Stony Creek project are very similar to those of the disposal site prior the New Haven dumping.

4.31 It can be expected that disposal of the small quantity of Stony Creek sediments will not appreciably alter the present site conditions. Metal characteristics of the project sediments and the disposal site prior to past dumping, would indicate little disturbance or impacts if the material should disperse outside the dump area.

4.32 Long Term Considerations. The full nature of long-term

TABLE 6

Bottom Sediment Analysis
New Haven Dump Site and Control Site

Parameter	Dump Site Range %	Avg. %
Volatile Solids (EPA)	0.79-5.39	4.39
C.O.D.	1.21-6.83	4.22
T.K.N.	0.02-0.18	0.13
Oil & Grease	0.036-0.278	0.10
Mercury X10-5	0.2-4.4	1.34
	(0.2-1.7)*	(0.91)
Lead $X10^{-3}$	0.26-5.27	3.03
	(1.14-3.31)	(2.27)
Zinc $X10^{-3}$	1.09-18.08	10.39
	(5.14-13.45)	(8.68)
Copper $X10^{-3}$	1.45-12.56	6.80
	(2.34-9.41)	(4.46)
Cadmium $X10^{-3}$	$<$0.09-0.09	$<$0.09
	($<$0.09-0.09	($<$0.09)
Chromium $X10^{-3}$	1.66-9.79	4.05
	(2.06-5.76)	(3.46)
Arsenic $X10^{-3}$	0.26-1.78	1.02
	(0.50-1.72)	(0.99)
Nickel	1.45-13.80	3.45
	(1.00-10.92)	(3.44)
Vanadium $X10^{-3}$	1.04-8.79	5.62
	(2.95-9.30)	(6.04)

*Test results shown in parenthesis are for 12 to 14 inch depth. All other test samples were collected from the top two inches.

Values shown are percent of sample's dry weight, and all tests are performed in accordance with EPA "Chemistry Laboratory Manual," unless otherwise noted.

TABLE 7: SUMMARY OF TEST RESULTS OF MATERIALS DREDGED
NEW HAVEN HARBOR, CONNECTICUT (1973)

Parameter	Maximum %	Minimum %	Mean-Average %
Volatile Solids (EPA Method)	10.03	0.54	6.06
Volatile Solids (NED Method)	8.32	0.26	4.80
Chemical Oxygen Demand	19.71	0.53	9.93
Oil and Grease	1.194	0.009	0.385
Total Kjeldahl Nitrogen	0.52	0.01	0.25
Mercury depth 0-3" ($x10^{-5}$)	.000099 (9.9)	.000002 (0.2)	.0000388 (3.88)
12-14"	.000076 (7.6)	.000001 (0.1)	.0000292 (2.92)
Lead depth 0-3" ($x10^{-3}$)	.0622 (62.2)	.00053 (0.53)	.00981 (9.81)
12-14"	.04896 (48.96)	.00047 (0.47)	.00781 (7.81)
Zinc depth 0-3" ($x10^{-3}$)	.1000 (100)	.0022 (2.2)	.02735 (27.35)
12-14"	.080 (80)	.0014 (1.4)	.02313 (23.13)
Copper depth 0-3" ($x10^{-3}$)	.0494 (49.4)	.0012 (1.2)	.01680 (16.80)
12-14"	0.521 (52.1)	.00090 (0.9)	.01747 (17.47)

Notes: Values shown are percent of sample's dry weight, and all tests are performed in accordance with EPA "Chemistry Laboratory Manual," unless otherwise noted.

impacts is not well understood. Studies of dredged material disposal sites have not monitored effects for more than a few years after disposal. The recent study at the New Haven site (Bokuniewicz, Berger, Gordon and others, June 1976) has been a part of an investigation that has lasted for three years since recent past disposals. Effects at a site may also be obscured if the site remains in use. Impacts of disposal on areas outside a site are difficult to assess since other sources of impacts cannot be controlled.

4.33 Research that has been done in Long Island Sound and elsewhere shows that an area can in many cases recover readily from the obvious acute effects of dredged material disposal. It appears that recolonization of benthic infauna and epifauna may occur almost immediately after dumping operations cease. Marked repopulation is expected after a seasons' spawning period. Effects of turbidity, possible nutrient increases, decreased light penetration, and changes in water quality do not persist for extended periods. Long-term impacts are essentially unquantified and need to be investigated in a comprehensive manner before effects can be predicted.

5.00 ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.01 Dredging and dredged material disposal in open waters creates impacts which cannot be eliminated. The severity of the impact can often be reduced through careful timing, disposal site management and project implementation.

5.02 The actual removal and disturbance of bottom sediments from the channel will cause the destruction of biota inhabiting the sediments, as well as attached plants and other organisms that cannot move out of the path of the operating dredge. Oysters are the primary marine specie of existing and potential importance for human use that will be affected. Some hard and soft shell clams, lobsters and crabs will also be affected. Dredging and dredge disposal operations will be confined to the period from 1 October to 27 May, inclusive. Such timing will circumvent the peak oyster spawning period and therefore will not interfere with spat settlement. Lobsters will not be significantly affected since their habitat is in deeper waters nearer the Thimble Islands.

5.03 Coincident with dredging will be the exposure and suspension of underlying anaerobic sediments. In addition to temporary turbidity increases, it is possible that some chemical constituents found in the sediments will be released into the water column. However, concentrations significantly higher then background levels are not likely as a result of dredging. Material suspended during dredging will resettle locally on adjacent bottom areas. Heavy sedimentation sufficient to cause burial of benthic organisms is not expected. Contact with the Long Island Oyster Farms Company, prime shellfish plot owner, indicated their willingness to remove oyster sets near the project to minimize any losses. Bucket and scow method of dredging and removal will also aid to reduce impacts.

5.04 Little or no change in bottom characteristics will take place due to siltation. Siltation effects will not be greater than those which occur from natural causes and will be minor and temporary in nature.

5.05 After dredging and open-water disposal of dredged material, most studies have shown that recolonization of disturbed bottom sediments is a fairly rapid process. This would indicate that acute physical impacts are not long lasting and probably have insignificant consequences to the ecological integrity of the area. The harbor has been previously dredged and so the channel would be indicative of a previously disturbed area.

5.06 The New Haven dump site has been previously used for the disposal of more than one million cubic yards of material. Disposal of the small amount of Stony Creek Harbor sediment is not expected to be significant. Turbidity may be disruptive to local schooling fish, but directly beneath the dump point the effect will be temporary and small to ecology of this region. The new bottom layer to be created will be thin and will not noticeably affect benthic communities. In areas of significant accumulation these benthic populations that cannot dig out will be eliminated. Studies have shown that recolonization is a rapid process at the New Haven site.

5.07 The long range cumulative impacts of open water disposal in Long Island Sound cannot be easily estimated. In quantitative terms the impacts have not been identified and documented. Some alteration of benthic communities and local bottom scavaging species, as well as physical and chemical characteristics can be expected in the vicinity of the disposal site.

6.00 ALTERNATIVE TO THE PROPOSED ACTION - MAINTENANCE DREDGING

6.01 No Action.

6.02 Beneficial Aspects of No Action. The expected environmental impact of the maintenance dredging project is minimal, therefore, there are no significant beneficial environmental aspects to the no action alternative.

6.03 Adverse Aspects of No Action. Failure to maintain the Stony Creek Harbor navigation project would result in an increase of groundings and tidal delays and eventually, a decrease in the use of the harbor. Without maintenance dredging, the development of marine facilities along the waterfront will have been pointless and these will gradually deteriorate as the harbor becomes inaccessible to vessels.

6.04 Rejection Reasoning of No Action. The adverse impacts of the no action alternative outweigh the beneficial aspects in terms of overall public interest. Without dredging, boating activity in Stony Creek Harbor will be gradually curtailed.

6.05 Alternative Dredging Methods. The means of dredging considered were the bucket and scow and hydraulic methods with the bucket and scow method being selected. Hydraulic dredging was rejected since this method required the use of land disposal areas in close proximity to the project. Land areas in the Stony Creek area are simply not available. Community development along the harbor front is extensive. Open areas consist primarily of productive wetlands.

6.06 There are essentially two conventional methods of dredging employed in New England navigational maintenance projects: hydraulic dredging and bucket dredging. The choice of dredging method has to be based on whether land disposal or open water disposal will be used. However, some differences in the environmental impacts of each dredge type do exist. The most apparent is the contact and mixing of relatively large amounts of water with the hydraulic dredge method. Concentrations of potentially toxic trace metals and other pollutants may increase in the water, a large part of which will ultimately re-enter the estuarine system. Bottom disturbance created by a hydraulic dredge may also be slightly higher than those resulting from bucket dredging. For either dredge, increases in suspended solids will be temporary, localized, and probably not a significant cause for concern.

6.07 Timing. Since the probable magnitude and extent of dredging-related impacts are influenced by the season during which the work is conducted the issue of timing must be considered. From the standpoint of decreasing or minimizing interference with boating use and impacts on shellfish spawning and larval attachment, summer dredging any time from June through September has been shown to be less desirable than dredging at other times of the year. Dredging in the autumn, winter, or early spring would avert the possibility of abnormal stresses on critical life stages of important species.

6.08 More innovative dredge disposal techniques, such as the creation of artificial islands or marshes, do not offer practicable solutions to the disposal problem in Stony Creek. The relatively small quantities of material that must be dredged are not sufficient for undertaking a project of this type. It is noted that neither marsh building nor island creation is very applicable in the Stony Creek area due to the lack of socially and environmentally acceptable sites. Plans for future use of land disposal sites cannot be projected. There is a possibility of natural encroachment of wetland vegetation on an area, as has occurred over other disposal sites, but disposition or use of the land rests with the local property owners. The availability of land disposal areas to be used in conjunction with a hydraulic dredge was discussed with the Branford Town engineer using aerial photographs and topographic maps. The locale around Stony Creek fits primarily into three general categories, all of which exclude them from use as suitable land disposal areas. The three categories are wetlands, extensively developed residential and commercial areas, and areas of high elevation which are beyond the pumping capabilities of a hydraulic dredge. The only area which was located near the project and within range of a dredge was a site located directly north of the project and adjacent to the southern side of the railroad tracks owned by Consolidated Rail Corporation. This is a previously filled area which the Town uses as an athletic field and declined to make available for the deposition of dredged material.

6.09 The New Haven disposal area is the only open water site acceptable to the State of Connecticut in Long Island Sound near Stony Creek. Other open water sites outside of the Sound would be too far to economically transport the dredged materials. The use of disposal sites in Long Island Sound is an open and unresolved issue at present. The Corps is currently discussing with the State of Connecticut Department of Environmental Protection, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service and the State of New York Department of Environmental Conservation, possible formats and scopes for a comprehensive, Sound-wide examination of dredged material disposal activities, needs, and impacts. Efforts are being directed toward resolution of conflicts, problems, and questions about dredging and dredged material disposal in the Sound. Fundamental issues include the location of regional disposal sites, what types and amounts of dredged material should be placed in specific sites, how often and when they should be used, the necessity for monitoring programs, and acceptable methods for making these determinations.

6.10 Prior to disposal of the Stony Creek dredged material, a monitoring effort will be accomplished at the disposal site which will be in line with the developing Sound-wide management program. Work will include bathymetric surveys and physical and chemical analyses of both sediments and benthos at the site.

6.11 Beach Nourishment. The material to be dredged is not the type that can be used for beach nourishment work. The sediments are predominantly in the silt-clay range of particle size. A substantial amount of organics also precludes its use for beach nourishment.

7.00 THE RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

7.01 The maintenance of the Federal navigation channel contributes to the long-term activity of the Stony Creek Harbor area. Use of the harbor for recreational fishing and related boating is an important characteristic of the community. The demand for marine facilities normally exceeds the supply. Maintenance of this harbor is essential to retain the existing services and access to landing and docking facilities. The prospect of new facilities is not possible without an adequate harbor.

7.02 It is important to continually assess the impacts of individual dredging projects. Primary though, is the necessity for expanding the evaluation to identify lasting impacts and managing them for long-term productivity. Necessary to proper management is a broader assessment of the regions disposal requirements, sediment and water quality, adequate dump site locations and marine ecosystems, and the monitoring of these activites. Only in this manner comes the assurance of providing future generations with a quality environment.

7.03 Land area is scarce for sites to dispose of dredged sediments. Most projects will eventually require open-water disposal in Long Island Sound. A wide area long-term management program is paramount to adequately regulate the resources. Such a management process is being addressed by the State of Connecticut and the Corps of Engineers, and the Department of Environmental Conservation of New York.

8.00 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

8.01 There will be several irretrievable losses as a result of the project. Losses of shellfish, crustaceans, and other benthic organisms during dredging and dredge disposal are irretrievable. However, this does not represent an irreversible loss. Reproduction and migration of nearby marine organisms will restore populations to the affected areas in relatively short time. Continued stress from bottom disturbances resulting from maintenance dredging and boating use may impair productivity in the channel. Reduction in use would enable revival of any disturbed resource.

8.02 The only irretrievable commitment of resources remains the expenditure of fuel to power the equipment associated with the dredging project.

9.00 COORDINATION AND COMMENT AND RESPONSE

9.01 In preparation of this environmental report, the proposed maintenance dredging of Stony Creek Harbor in Connecticut, has been discussed and coordinated (orally and/or in written communication) with those listed below

U.S. Government

Fish and Wildlife Service, Concord, N.H.

National Marine Fisheries Service, Gloucester, MA and Milford, CT

Environmetnal Protection Agency, Region I, Boston, MA

State of Connecticut

Department of Environmental Protection, Hartford, CT

Department of Public Health, Environmental Health Division,
Hartford, CT

Local Concerns

Town Selectmen for Stony Creek, Branford, CT

Harbor Master, Town of Branford, CT

Secretary, Stony Creek Boaters Assoc., Stony Creek, CT

Long Island Oyster Farm Co., New Haven, CT

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CONCLUSIONS

Based on my review of the information within the project's assessment and in consideration of the general public need, I believe the project as described should proceed according to schedule. In my evaluation the assessment prepared in accordance with the National Environmental Policy Act of 1969 is an accurate document revealing that the negative environmental impacts associated with the project are minor. The assessment, therefore, precludes the need for preparation of an environmental impact statement.

2 February 1977
DATE

John P. Chandler
JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

APPENDIX A

WATER QUALITY

WATER QUALITY STANDARDS

Department of Environmental Protection

State Office Building

Hartford, Connecticut

1974

Pursuant to the provisions of Section 25-54e of the 1971 Noncumulative Supplement to the General Statutes of Connecticut, notice was published in the Connecticut Law Journal on January 22, 1974 that the Commissioner of Environmental Protection amended, on November 30, 1973 Water Quality Standards for the surface waters of the State of Connecticut and that, under the Federal Water Pollution Control Act, the Regional Administrator of the U. S. Environmental Protection Agency approved said amendments in their entirety on December 19, 1973.

In accordance with State law, Connecticut's Water Quality Standards were initially adopted on November 17, 1969 by the Water Resources Commission, approved by the U. S. Secretary of Interior on April 21, 1970 and notice thereof published in the Connecticut Law Journal on May 26, 1970.

INLAND WATERS

CLASS B

Suitable for bathing, other recreational purposes, agricultural uses, certain industrial processes and cooling; excellent fish and wildlife habitat; good aesthetic value.

1. Dissolved oxygen	75% saturation, 16 hours/day; 5 mg/l at any time
2. Sludge deposits - solid refuse - floating solids, oils and grease - scum	None except for small amounts that may result from the discharge from a waste treatment facility providing appropriate treatment.
3. Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity provided all reasonable controls are used.
4. Color and turbidity	Turbidity shall not exceed 25 JTU, B_c 10 JTU. A secchi disk shall be visible at a minimum depth of 1 meter, B_B-criteria may be exceeded.
5. Coliform bacteria per 100 ml	Not to exceed a median of 1000 nor more than 2400 in more than 20% of samples collected.
6. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class nor cause taste and odor in edible fish.
7. pH	6.5 - 8.0
8. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 85°F, or in any case raise the normal temperature of the receiving water more than 4°F. B_s -

	same as A.
9. Chemical constituents (a) Phosphorus	No point source discharge which will raise phosphorus concentration of the receiving waters to an amount in excess of 0.03 mg/l.

The use of subscript "s" in Class B is to identify areas suitable for cold water fisheries including fish spawning and growth.

COASTAL AND MARINE WATERS

CLASS SA

Suitable for all seawater uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing, and other water contact sports, may be subject to absolute restrictions on the discharge of pollutants; authorization of new discharges other than cooling or clean water may require revision of the class to Class SB (See General Policy 5) which would be considered concurrently with the issuance of a permit at public hearing.

1.	Dissolved oxygen	Not less than 6.0 mg/1 at any time.
2.	Sludge deposits - solid refuse - floating solids, oils and grease - scum	None allowable
3.	Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity provided all reasonable controls are used.
4.	Color and turbidity	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity provided all reasonable controls are used. A secchi disc shall be visible at a minimum depth of 1 meter, SA_B - criteria may be exceeded.
5.	Coliform bacteria per 100 ml	Not to exceed a median MPN of 70 and not more than 10% of the samples shall ordinarily exceed an MPN of 230 for a 5-tube decimal dilution of 330 for a 3-tube decimal dilution.
6.	Taste and odor	None allowable
7.	pH	6.8 - 8.5

8. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83°F or in any case raise the normal temperature of the receiving water more than 4°F. During the period including July, August, September, the normal temperature of the receiving water shall not be raised more than 1.5°F unless it can be shown that spawning and growth of indigenous organisms will not be significantly affected.
9. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.

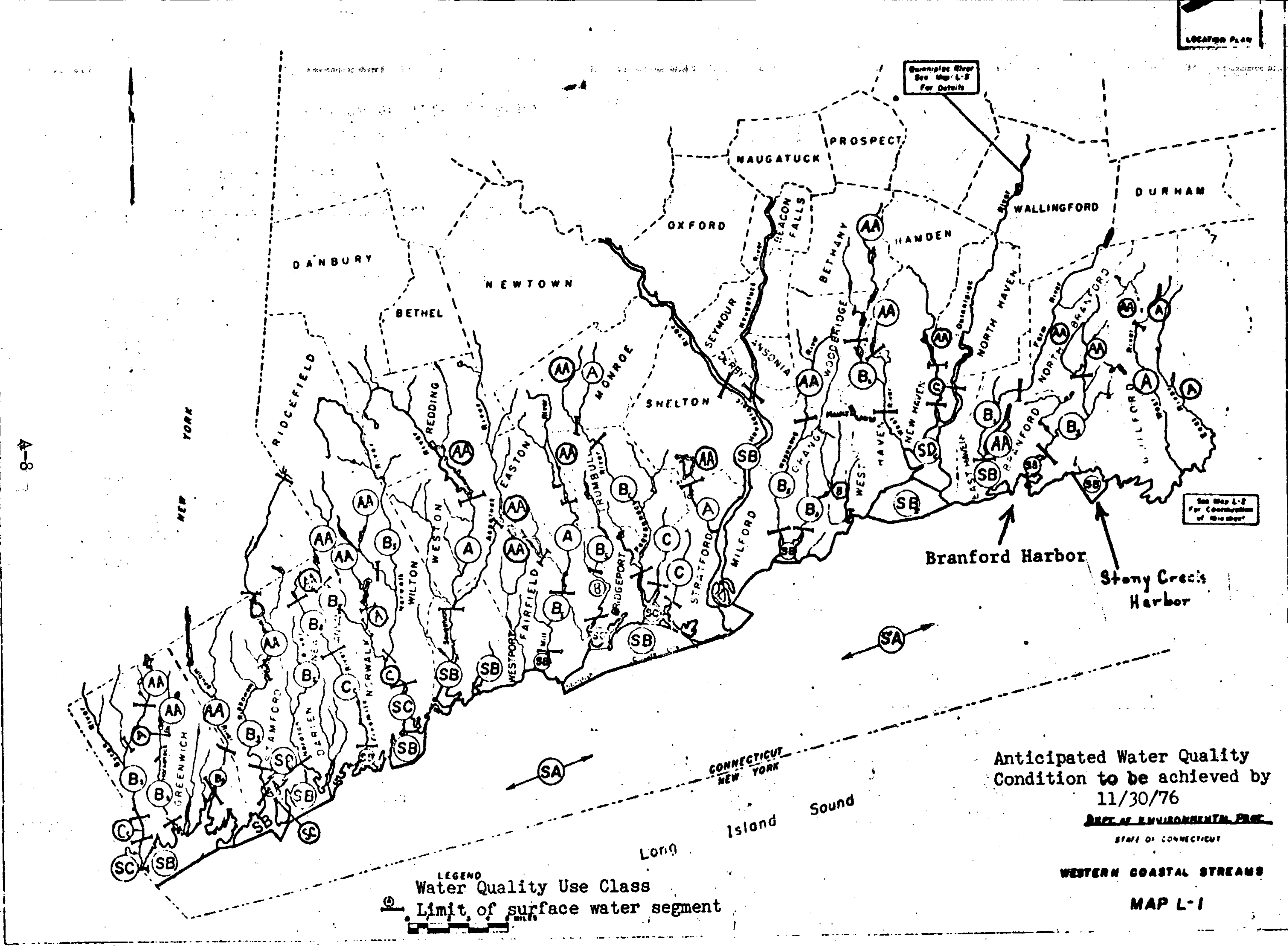
CLASS SB

Suitable for bathing, other recreational purposes, industrial cooling and shellfish harvesting for human consumption after depuration; excellent fish and wildlife habitat; good aesthetic value.

1. Dissolved oxygen	Not less than 5.0 mg/l at any time.
2. Sludge deposits - solid refuse - floating solids, oils and grease - scum	None except for small amounts that may result from the discharge from a waste treatment facility providing appropriate treatment.
3. Sand or silt deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity provided all reasonable controls are used.
4. Color and turbidity	A secchi disc shall be visible at a minimum of 1 meter SB_B - criteria may be exceeded.
5. Coliform bacteria per 100 ml	Not to exceed a median value of 700 and not more than 2300 in more than 10% of the samples.
6. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
7. pH	6.8 - 8.5
8. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83°F or in any case raise the normal temperature of the receiving water more than 4°F. During the period including July,

August and September, the normal temperature of the receiving water shall not be raised more than 1.5°F unless it can be shown that spawning and growth of indigenous organisms will not be significantly affected.

9. Chemical consitutents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this class.


LOCATION PLAN
Quinnipiac River See Map L-2 For Details
See Map L-2 For Continuation of Shoreline
DANBURY
BETHEL
NEWTOWN
OXFORD
NAUGATUCK
PROSPECT
BEACON FALLS
BETHANY
HAMDEN
WALLINGFORD
DURHAM
NORTH HAVEN
NORTH BRANFORD
GUILFORD
BRANFORD
EAST HAVEN
NEW HAVEN
WEST HAVEN
ORANGE
WOODBRIDGE
ANSONIA
SEYMOUR
DERBY
SHELTON
MONROE
MILFORD
STRATFORD
TRUMBULL
BRIDGEPORT
EASTON
FAIRFIELD
WESTPORT
WESTON
REDDING
RIDGEFIELD
WILTON
NORWALK
NEW CANAAN
DARIEN
STAMFORD
GREENWICH
NEW YORK
CONNECTICUT
NEW YORK
Long Island Sound
Branford Harbor
Stony Creek Harbor
Anticipated Water Quality
Condition to be achieved by
11/30/76
DEPT. OF ENVIRONMENTAL PROT.
STATE OF CONNECTICUT
WESTERN COASTAL STREAMS
MAP L-1
LEGEND
Water Quality Use Class
Limit of surface water segment
MILES

BRANFORD HARBOR, CONN.

Sample No.	Lab Serial No.	Total Mercury ug/l	Total Copper ug/l	Total Lead ug/l	Total Zinc ug/l	Total Arsenic ug/l	Total Cadmium ug/l	Total Chromium ug/l	Total Nickel ug/l	Total Vanadium ug/l	Salinity ppm
1	100-178-1	0.0	27	4	12.5	4	1.0	< 5	5	< 8	22,000
2	100-178-2	1.0	13	< 4	9.5	5	1.0	< 5	5	< 8	24,000
3	100-178-3	2.3	22	8	25.0	3	1.5	< 5	8	< 8	13,000
4	100-178-4	0.3	19	4	21.0	5	1.0	< 5	8	< 8	9,000
	Average concentrations found in seawater[1]	.03	2	.05	12.3	4	.113	.3	5.4	2.5	
	Concentrations having toxic effects on marine life[2]	100	100	100	10,000	2,000	10-10,000	1,000	100		

FOOTNOTE 1 Handbook of Marine Science V.11
F. G. Walton Smith Ed.
CRC Press 1974

FOOTNOTE 2 Long Island Sound Regional Study
Ecological Studies an Interim Report
February 1974

APPENDIX B

COMMON PLANTS OF THE AREA

APPENDIX B

List of Plant Species Identified from Areas Around Branford Harbor and expected in the Stony Creek Area.

COMMON NAME	SCIENTIFIC NAME
Glasswort	*Salicornia europea*
	Juncus secundus
Marsh-elder	*Iva frutescens*
Salt meadow hay	*Spartina patens*
Spikegrass	*Distichlis spicata*
Sea lavender	*Limonium carolinianum*
Salt marsh cordgrass	*Spartina alterniflora*
Beech	*Fagus grandifolia*
Birch	*Betula papyrifera*
Bittersweet	*Solanum dulcamara*
Reedgrass	*Phragmites communis*
Common yarrow	*Achillea millefolium*
Dandelion	*Taroxacum officinale*
Hop hornbean	*Ostrya virginiana*
Multiflora rose	*Rosa multiflora*
Northern Red oak	*Quercus borealis*
Privet	*Ligustrum vulgare*
Red Cedar	*Juniperus virginiana*
	Prunus spp.
	Pyrus sp.
Salt marsh aster	*Aster tenuifolius*
Salt marsh goldenrod	*Solidago sempervirens*
Sand-spurrey	*Spergularia marina*
Sassafras	*Sassafras albidum*
Scarlet oak	*Quercus coccinea*
Vervain	*Verbena* spp.
Scrub Pine	*Pinus virginiana*
Silverberry	*Eleagnus umbellate*
Staff-tree	*Celastrus scandens*
Staghorn sumac	*Rhus typhina*
Sugarberry	*Celtis accidentalis*
	Ulmus spp.
	Vaccinium spp.
White oak	*Quercus alba*
Wild ryegrass	*Elymus virginicus*
Plantain	*P. maritima*
Brambles	*Rubus* spp.
Broom-sedge	*Andrapogon virginicus*
Bull thistle	*Cirsium vulgare*

APPENDIX B (CONT.)

COMMON NAME	SCIENTIFIC NAME
Climbing buckwheat	Polygonum scandens
Cottonwood	Papulus deltoides
Dropseed	Sporoblous spp.
Greenbriar	Smilas glauca
Japanese honeysuckle	L. japonica
Little bluestem	Andropogon scoparius
Orach	Atriplex patula
Pepper weed	Lepidium virginicum
Pokeweed	P. americana
Primrose	Oenothera spp.
Rabbit-tobacco	Gnaphalium obtusifolium
	Rosa spp.
wild carrot	Daucus carota

APPENDIX C

PLANKTON

Branford Harbor is sample station #28 for the Connecticut Department of Environmental Protection Biological monitoring program. This sampling program, in addition to plankton, included periphyton, macrophyton, macroinvertebrates, and fish. Date of sampling was 8/9/74, water temperature was 20 ^{o}C, average depth was 3.2m, and no thermal stratification was observed. Sample location was centrally located in the Outer Harbor area.

1. Plankton
   (a) Phytoplankton

	Relative Abundance %
CYANOPHYCEAE	
Non-filamentous blue-green algae	
Anacystis	21.3
CHLOROPHYCEAE	
Non-filamentous green algae	
Actinastrum	2.3
Closteriopsis	4.7
Chlorella	7.3
Filamentous green algae	
Ulothrix	4.7
BACILLARIOPHYCAEAE	
Centric diatoms	
Thalissiosira	33.5
Pennate diatoms	
Gyrosigma	4.7
Synedra	4.7
DINOPHYCEAE	
Dinoflagellates	
Peridinium	7.3
Pyrophacus	9.5

(b) Zooplankton

	Relative Abundnance %
ANTHROPODA	
Nauplius larvae	54.0
OTHER INVERTEBRATA	
Rotifera	23.0
ANNELIDA	
Trochophore larvae	23.0

2. Periphyton

BACILLARIOPHYCEAE	
Pennate diatoms	
Synedra	1.2
Meridion	0.6
Thalassiothrix	0.2
Diatoma	7.7
Coccomeis	1.6
Nitzchia	1.0
Fragilaria	4.5
Achananthes	0.2
Cymbella	0.8
DINOPHYCEAE	
Dinoflagellates	
Diplosalis	0.2
PROTOZOA	
Halteria	0.2
CYANOPHYCEAE	
Non-filamentous blue-green algae	
Coccochloris	0.4

	Relative Abundance %
Filamentous blue-green algae	
Entophysalis	3.5
Oscillatoria	58.0
CHLOROPHYCEAE	
Non-filamentous green algae	
Ankistrodesmus	1.8
Fremosphaera	0.2
Chlorococcum	3.1
Filamentous green algae	
Coleochaete	2.6
BACILLIARIOPHYCEAE	
Centric diatoms	
Cyclotella	9.6
Melosira	1.2
Ceratulus	1.4

3. Macrophyton

    Codium fragile

    Polyides rotundus

    Ulva lactuca

    Fucus sp.

4. Macroinvertebrates

    Mytilus

    Balanus

    Ericthonius

5. Fish

    Porgy

APPENDIX D

INVERTEBRATES

INVERTEBRATES LISTED IN THE
COKE WORKS ELECTRIC GENERATING PLANT
FINAL ENVIRONMENTAL STATEMENT
NEW HAVEN HARBOR, CONNECTICUT

Bottom Invertebrates:

Coelenterata

Bouganivillea carolinensis
Metridium dianthus

Platyhelminthes

Trigonoporous folium

Nemertea

Cerebratulus lacteus

Annelida

Lepidasthenia grimaldii
Lepidonotus squamatus
Nereis arenaceodonta
N. succinea
N. virens

Arthropoda

Neomysis americana
Balanus eberneus
Cancer irroratus
Crangon septemspinosa
C. vulgaris
Homarus americanus
Neopanope texana
Palaemonetes intermedius
Limulus polyphemus

INVERTEBRATES LISTED IN THE
COKE WORKS ELECTRIC GENERATING PLANT
FINAL ENVIRONMENTAL STATEMENT
NEW HAVEN HARBOR, CONNECTICUT
(continued)

Mollusca

Callocardia morrhuana
Crassostrea virginica
Mya arenaria
Pholas costata
Spisula polynyma
Tellina agilis
Mercenaria mercenaria
Crepidula fornicata
C. plana
Littorina littorea
Nassarius obsoleta
N. bivittata
Tornatina canaliculata
Urosalpinx cinerea

Urochordata

Molgula manhattensis

INVERTEBRATES EXPECTED TO OCCUR IN BRANFORD HARBOR

Species	Habitat	Range	Abundance in New England
Arthropoda (amphipods)			
Gammarus palustris	Estuaries, mainly benthic, also under damp debris boards & stones	New Hampshire to northern Florida	Common
Orchestia grillus	Littoral	Boreal species that have been found as far south as 39° latitude	Common
Orchestia uhleri	Salt marshes and estuaries. Under debris among *Spartina* roots and on grass stems	Maine, Florida, Gulf of Mexico and as far south as 43° latitude, a temperate species	Common
Arthropoda (crabs & other crustaceans)			
Carcinus meanus (Green crab)	Beaches, estuaries	Maine to New Jersey	Common
Sesarma reticulatum (Marsh crab)	Burrows in salt marshes. Associated with *Uca pagnax*	Occurs along eastern seaboard northward to Cape Cod	Common
Uca sp. (Fiddler crab)	Burrows in the mud and sand of the saltmarshes	Eastern Atlantic coast northward to Cape Cod	Very common
Callinectes sapidus (Blue crab)	In estuaries	Occurs from Cape Cod southward to Florida and around the Gulf of Mexico to Mississippi	Common
Balanus balanoides (Acron barnacle)	Intertidal rocks	Arctic Ocean to Delaware Bay	Abundant

Species	Habitat	Range	Abundance in New England
Mollusca (clams & snails)			
Modiolus demissus (Ribbed mussel)	Abundant on mudflats and sand spits, often exposed at low tide	Ranges from Prince Edward Island to South Carolina and Georgia	Common
Mercenaria mercenaria (Northern quahog)	Intertidal shallow on sandy or muddy bottoms	Gulf of Saint Lawrence to the Gulf of Mexico	Common
Mya arenaria (Soft shellclam)	Shallow, muddy bottoms, estuaries	Arctic seas to North Carolina	Common
Littorina saxatilis (Rough periwinkle)	Littoral	Boreal species that have been found as far south as 39° latitude	Common
Crepidula convexa (Slipper limpet)	Shallow	Between Cape Cod and the Bay of Fundy. Temperate species	Common
Nassarius obsoletus (Mud snail)	Estuaries	Atlantic seaboard	Abundant
Littorina litorea (Common periwinkle)	In estuaries	Coast of Canada, Maine and Mass. to the Long Island Sound	Common
Annelida (worms)			
Enoplobranchus sanguineus (Polychaete worm)	Readily found at the low water mark in mud and sand	Common along the eastern seaboard from the Gulf of St. Lawrence to Virginia	Common
Nereis virens (Clam worm)	Occurs under stones or burrows in the sand or mud in sheltered bays and sounds, where it is common at the low water mark	Widely distributed from south New England along the entire north-eastern coast to Labrador, continuing around through the Artic region to the northern coasts of Europe and Great Britain	Common

Species	Habitat	Range	Abundance in New England
Podarke obscura (polychaete worm)	Found in great abundance at Woods Hole, Mass. among eel-grass and swimming at the surface of Eel Pond and other quiet waters		Common
Lumbrineris spp.	Littoral to 3446 meters	Between Cape Cod and Bay of Fundy Temperate species	Common
Nereis succinea	Littoral to 46 meters euryhaline; min. salinity 16 0/00	Between Cape Cod & Bay of Fundy; temperate species	Common
Orbinia ornata	Littoral to 33 meters	Temperate species	Common
Scoloplos robustus	Littoral to 57 meters	Between Cape Cod and Bay of Fundy; temperate species	Common
Cnidaria (Sea anemones)			
Haloclava producta (Burrowing sea anemone)	Shallow, euryhaline, min. salinity given 16 0/00	Temperate species	Common
Haliplanella luciae	Littoral, eurythermal	Between Cape Cod & Bay of Fundy; temperate species	Common
Chordata			
Saccoglossus kowalewski (acorn worms)	Littoral to a few meters, euryhaline minimum salinity given 16%.	Temperature species extending north into Cape Cod Bay	Common

SOURCE

Species List from Olmstead (Personal Communication).
Data compiled by Environmental Analysis Branch, NED.

With the cooperation of Tom Hoehn from the Connecticut Department of Environmental Protection, grab samples were taken on the 13th of December 1974 in Branford Harbor. The grab used was a modified Van Veen with an area of 1/23 m^2. See map for grab sample locations (page F-10).

Grab #1. This sample consisted almost entirely of shell fragments of the bivalve Mulinia lateralis. A dry weight of 13.5 g was obtained. Rough calculations based on data from Rhodes (1973 a, b; 1974), indicate a concentration in excess of $2x10^5$ individuals per m^2. This large concentration must represent many growing seasons or a deposition area was sampled. Other animals present were:

4 Nassarius trivittatus
1 Yoldia limatula
2 Nephthys sp
15 Amphipod tubes
2 Ensis directus (shells)

Grab #2. A predominance of tube dwelling amphipods, 50-100 live:

2 Ensis directus (shells)
30 Mulinia lateralis (shells)
Oyster shell fragments
1 Nassarius trivittatus
1 Petricola pholadiformis (shell)
1 tube Pectinaria gouldii
1 polychate

Grab #3. Tube dwelling amphipod approximately 1500

1 Ensis directus

1 Nassarius trivittattus

3 Nephthys sp.

2 Polychaetes

Grab #4. Tube dwelling amphipods numbering approximately 200

50 Mulinia lateralis (shells)

2 Petricola pholadiformis

4 Ensis direttus

1 Nassarius trivittatus

Grab #5. This sample was marked with a strong marine order (H_2S). In addition detritus consisting of leaf fragments was prevalent. Tube dwelling amphipods numbering about 500 dominated the sample.

1 mud crab

1 Nephthys sp.

1 Polychaete

1 Pholas sp.

1 Anomia simplex

3 Mya arenaria (shells)

Summary of Ampelisca communities Pratt (1973).

"Ampelisca Communities. One of the more distinct faunal groups found in Mid-Atlantic Bight estuarine areas is characterized by dominance of amphipod crusteceans of the genus Ampelisca. These have been well described in southern New England bays and sounds where they occur on relatively shallow sand and silt-sand bottoms, often surrounding Nephtys-Nucula communities on deeper muddy bottoms. Offshore Ampelisca communities are much less well known."

"Ampeliscids build flat tubes which extend several centimeters into the sediment and a few millimeters to a centimeter above it. The animals suspend themselves, ventral side up, in the mouths of these tubes, and feed by using their long 2nd antennae to either 'whirl' detritus off the bottom or to collect it from the sediment surface. Densities of several thousand adults or tens of thousands of juveniles per m^2 (Table 1) result in a dense mat of tubes covering the bottom."

"Table 1. Maximum numbers of Ampelisca species reported from Atlantic coastal areas (density/m^2)

Barnstable Harbor	43,200	A. abdita	(Mills, 1967b)
Buzzards Bay	31,628	A. 'spinipes'	(Sanders, 1958)
Narragansett Bay	1,070	A. 'spinipes'	(Phelps, 1958)
	9,780	A. 'spinipes'	(Stickney & Stringer, (average) 1957)
Long Island Sound	1,885	A. abdita	(Sanders, 1956)
	1,306	A. vadorum	(Sanders, 1956)
Great Bay, N.J.	10,000	A. abdita	(Durrand & Nadeau, 1972)
Rhode Island	35,390	A. agassizi	(Pratt, Unpublished)
	18,330	A. agassizi	(Pratt, Unpublished)"

"Ampelisca communities are relatively productive in terms of species eaten by fish (mainly crustacea, polychaetes, and small bivalves). The dry weight of Ampelisca alone may be as high as 11 gm/m^2 (Sanders, 1956), but 5 g/m^2 may be a more representative value. Since Ampelisca reproduces twice a year, actual production is higher than the standing crop would indicate. Sanders estimated a productivity-standing crop ratio of 5:1.

There may be continuous recruitment of young into the fish foot size class throughout the summer. Juvenile winter flounder and scup feed extensively on Ampelisca in Long Island Sound (Richards, 1963). Adult winter flounder feed on Ampelisca in Narragansett Bay."

"The studies of Mills and Sanders on amphipod communities in southern New England only begin to provide the information necessary to understand their organization, productivity, and sensitivity to disturbance. Research is needed on the ecology of subtidal populations. Some areas of importance include succession and competition within beds, correlation with distribution of commercial bivalves, decapod feeding in beds, and resistance of colonies to both mechanical disturbance and chemical pollutants. The finding that amphipods are sensitive to hydrocarbon pollution (Sanders et al., 1972) and to general organic pollution (Pearce, 1970) suggests that the historical distribution of beds should be examined in order to detect long term trends in environmental quality."

APPENDIX E

FISHERY

COMMON FISHES OF LONG ISLAND SOUND

LONG ISLAND SOUND INTERIM REPORT

COMMON NAME	SCIENTIFIC NAME
Grubby	*Myoxocephalus aeneus*
Shorthorn sculpin	*Myoxocephalus scorpius*
Longhorn sculpin	*Myoxocephalus octodecemspinosus*
Sea raven	*Hemitripterus americanus*
Summer flounder	*Paralichthys dentatus*
Fourspot flounder	*Paralichthys oblongus*
Windowpane	*Scophthalmus aquosus*
Yellowtail flounder	*Limanda ferruginea*
Winter flounder	*Pseudopleuronectes americanus*
Hogchoker	*Trinectes maculatus*
Northern puffer	*Sphoeroides maculatus*
American eel	*Anguilla rostrata*
Blueback herring	*Alosa aestivalis*
Alewife	*Alosa pseudoharengus*
American shad	*Alosa sapidissima*
Atlantic herring	*Clupea harengus harengus*
Atlantic menhaden	*Brevoortia tyrannus*
Bay anchovy	*Anchoa mitchilli*
Brown trout	*Salmo trutta*
Rainbow smelt	*Osmerus mordax*
White catfish	*Ictalurus catus*
Oyster toadfish	*Opsanus tau*
Atlantic cod	*Gadus morhua*
Silver hake	*Merluccius bilinearis*
Atlantic tomcod	*Microgadus tomcod*
Pollock	*Pollachius virens*
Red hake	*Urophycis chuss*
Ocean pout	*Macrozoarces americanus*
Sheepshead minnow	*Cyprinodon variegatus*
Banded killifish	*Fundulus diaphanus*
Mummichog	*Fundulus heteroclitus*
Striped killifish	*Fundulus majalis*
Tidewater silverside	*Menidia beryllina*
Atlantic silverside	*Menidia menidia*
Northern pipefish	*Syngnathus fuscus*
White perch	*Morone americana*

COMMON FISHES OF LONG ISLAND SOUND (CONT.)

COMMON NAME	SCIENTIFIC NAME
Striped bass	*Morone saxatilis*
Black sea bass	*Centropristes striatus*
Bluefish	*Pomatomus saltatrix*
Scup	*Stenotomus chrysops*
Weakfish	*Cynoscion regalis*
Spot	*Leiostomus xanthurus*
Northern kingfish	*Menticirrhus saxatilis*
Tautog	*Tautoga onitis*
Cunner	*Tautogolabrus adspersus*
American sand lance	*Ammodytes americanus*
Atlantic mackerel	*Scomber scombrus*
Butterfish	*Peprilus triacanthus*
Northern searobin	*Prionotus carolinus*

This table summarizes the 49 most common species among the more than 100 finfish species known to occur in Long Island Sound.

Source: Ecological Studies, An Interim Report of the Long Island Sound Regional Study, January, 1974. New England River Basins Commission.

FISH SPECIES LISTED IN THE FINAL ENVIRONMENTAL STATEMENT
COKE WORKS ELECTRIC GENERATING PLANT
NEW HAVEN HARBOR, CONNECTICUT

Species	Habitat	Range	Abundance in New England
Microgadus tomcod (Tomcod)	Estuaries, salt water, stream mouths, brackish	North American coastal waters from the Gulf of St. Lawrence and northern Newfoundland to Virginia, running up into fresh water	Common
Urophycis chuss (Red hake)	Harbors; salt water	Exclusively American continental waters from Gulf of St. Lawrence and southern part of Grand Bank of New Foundland southward to the Middle Atlantic States	Very common
U. tenuis (White hake)	Harbors; salt water	Known off N. Caroline north to Gulf of St. Lawrence to Grand Bank of N. Foundland	Very common
Pungitius pungitius (Nine-spined stickleback)	Estuaries; hardly touch the open waters of the Gulf. Fresh and salt waters	Nova Scotia & Bay of Fundy to Cape Cod	Common
Syngnathus fuscus (Common pipefish)	Salt marshes, harbors & river mouths; salt & brackish	Coast of eastern North America from the southern side of the Gulf of St. Lawrence and Outer Nova Scotia at Halifax to S. Carolina	Abundant

Species	Habitat	Range	Abundance in New England
Morone saxatilis (Striped bass)	Strictly an in-shore fish	Atlantic coast of E. N. America from the lower St. Lawrence River and the southern side of the Gulf of the St. L. to N. Florida	Reasonably plentiful
Cynoscion regalis (Weakfish)	Shallow waters off Atlantic Coast	Eastern coast of the U. S. from the east coast of Florida to Mass Bay., straying northward to the Bay of Fundy and perhaps to Nova Scotia	Limited
Stenotomus chrysops (Scup)	Inshore from early April at Chesapeake Bay and from early May Northward to S. MA. Winter off Virginia & N. Carolina	East Coast of U. S. from N. Carolina to Cape Cod, casual in the Gulf of Maine as far as Eastport, Maine	Limited
Tautoga onitis (Tautog)	Strictly a coastwise fish	Atlantic coast of N.A. from the outer coast of Nova Scotia to S. Carolina, chiefly south of Cape Ann; most abundant between Cape Cod & the Delaware Capes	Common
Tautogolabrus adspersus (Cunner)	Coastal fish	Atlantic Coast of N.A. and the offshore banks from Conception Bay east coast of Newfoundland, and the western & southern parts of the Gulf of St. Lawrence southward in abundance to N.J. and occasionally as far as the mouth of the Chesapeake Bay	Common
Prionotus carolinus (Northern sea robin)	Smooth hard bottom less often on mud or about rocks. In-shore May or June	Coastal waters of eastern north America from the Bay of Fundy to S. Carolina; chiefly west and south from Cape Cod	Plentiful

Species	Habitat	Range	Abundance in New England
Myoxocephalus aeneus (Grubby)	From tide mark to 15 fathoms. All types of bottoms, most abundantly among eel grass	North American coastal waters from New Jersey to Northern Nova Scotia and the Gulf of St. Lawrence, both in the southern side, where it is common, and the Strait of Belle Isle	Common
Myoxocephalus octodecemspinosus (Longhorn sculpin)	Along shores, shoal harbors, and bays where it comes up on the flats at high tide. Never in fresh water.	Coastal waters of eastern North America from Eastern Newfoundland and the north shore of the Gulf of St. Lawrence, south regularly to N.J. and reported to the Atlantic Coast of Virginia	Common
Pholis gunnellus (Rock eel)	Found along low tide mark, left by the ebb in little pools of water, under stones or among seaweed awaiting the return of the tide. Down to 40 fathoms. Pebbly, gravelly, or stoney ground, or shell beds, and not mud or eelgrass	Shoal waters on both sides of the N. Atlantic from Hudson Strait to the offing of Delaware Bay on the American coast	Common
Paralichthys oblongus (Four-spotted flounder)	23 fathoms to 150 fathoms	Taken between the eastern part of Georges Bank and the coast of South Carolina. Its center of abundance appears to lie between S. New England & Delaware Bay	Plentiful

Species	Habitat	Range	Abundance in New England
Trinectes maculatus (Hogchoker)	Confined to immediate vicinity of coast. Common in bays, estuaries, where water is more or less brackish	Off the Atlantic & Gulfcoasts of N. Amer. from Mass. Bay to the Atlantic coast of Panama. Abundant in Chesapeake and to the southward, and moderately common as far north as S. New England, but it is rare north of Cape Cod	Rare
Mustelis canis (Smooth dogfish)	Shorefish and bottom swimmer, enters shoal harbors & bays, & even coming into fresh water down to depth of 80-90 fathoms	Coastal waters of the Western Atlantic, from Uruguay & Southern Brazil, regularly to Cape Cod, & to Passamaquoddy Bay as a stray; also Bermuda	Common
Menidia menidia (Atlantic silverside)	Sands or gravelly shores	Southern part of Gulf of St. Lawrence & Nova Scotia coast to Mass. Bay to Chesapeake Bay & Woods Hole	Very common
Scophthalmus aquosus (Windowpane)	Shoal-water fish	Coastal waters of eastern N.A. from the Gulf of St. Lawrence to S. Carolina; most abundant west & south of Cape Cod, north & east of which it is confined to favorable localities	Most common except locally
Pseudopleuronectes americanus (Winter flounder)	Inshore muddy sand patches of eelgrass to between 25 and 45 fathoms	Atlantic coast of N.A. from the coastline out to the offshore fishing banks.	Most common shoal water flounder

Species	Habitat	Range	Abundance in New England
Alosa aestivalis (Blueback herring)	Salt water	South of northern Florida, north to southern N.E. in abundance; north to Cape Brenton, Nova Scotia	Abundant
Alosa pseudoharengus (Alewife)	Anadromous coastal	Gulf of St. Lawrence & north Nova Scotia south to North Carolina; landlock species also exist in Lake Ontario and in the Finger Lakes of New York	Very abundant
Brevoortia tyrannus (Atlantic menhaden)	Coastal waters	Atlantic coast of America from Nova Scotia to Eastern Florida, Gulf of Mexico to Argentina	Once abundant but species population declining
Anchoa hepsetus (Striped anchovy)	Coastal waters	Abundant from Chesapeake Bay to the West Indies and South to Uruguay; north as a stray to Maine and to the outer coast of Nova Scotia; a more southerly fish than the other anchovy	Very limited
Anchoa mitchilli (Anchovy)	Sandy beaches and the mouths of rivers	Coast of the U. S. from Maine to Texas, chiefly west & south of Cape Cod	Common
Osmerus mordax (Smelt)	Estuaries found within 2 or 3 fathoms	East coast of N. America from Eastern Labrador, Strait of Belle Isle, to Virginia; also in New Hampshire and Maine	Common

Species	Habitat	Range	Abundance in New England
Anguilla rostrata (American eel)	Breed far out to sea but develop either in estuarine situations or fresh water. Seek muddy bottom & still water	Coasts and streams of west Greenland, eastern New Foundland, Strait of Bell Isle, and northern side of Gulf of St. Lawrence south to Gulf of Mexico, Panama, West Indies, and rarely to the northern coast of South America	Universal
Fundulus heteroclitus (Mummichog)	Sheltered shores where the tide flows over beds of eelgrass or salt hay. Tidal creeks, salt marshes, brackish waters	Coast of N. America, from the Gulf of St. Lawrence to Texas, Port au Port Bay, on the west coast of Newfoundland is most northerly limit	Very common
Fundulus majalis (Striped killifish)	Restricted to immediate neighborhood of land	Coast of U. S., from vicinity of Boston to Florida	Very common
Enchelyopus cimbrius (Four beard rockling)	Bottomfish shallow water to 25-30 fathoms, smooth muddy sand	Both sides of N. Atlantic. Northern part of Gulf of St. Lawrence & northeastern coast of Newfoundland to Narragansett Bay & Long Island Sound	Common
Merluccius bilinearis (Silver hake)	Coastal and open waters independent of depth	Continental shelf of eastern North America., northward to the Newfoundland Banks, southward to the offing of S. Carolina. Most abundant between Cape Sable & New York	Common

Species	Habitat	Range	Abundance in New England
Clupea harengus (Atlantic herring)	Coastal and open waters	Both sides of N. Atlantic north of Norway, Ireland, Spitzbergen and White Sea; south to Straits of Gibraltar; north to Labrador and Greenland, south to Cape Cod and Block Island	Once abundant but now species population declining
Ammodytes americanus (Sand lance)	Found chiefly along sandy foreshores, also over the shoaled parts of the offshore fishing banks.	Atlantic coast of N. Amer. from Cape Hatteras to the Gulf of St. Lawrence, northern Newfoundland & northern Labrador, perhaps to Hudson Bay	Very plentiful
Gasterosteus aculeatus (Three-spined stickleback)	Shore fish; estuarine	Coasts & fresh waters of the northern hemisphere; from Labrador, the Strait of Belle Isle and northern Newfoundland to lower Chesapeake Bay on the Eastern Coast of America	Very plentiful
Morone americana (White perch)	Coastal fish restricted in seaward range Breeding in fresh or brackish water and permanently landlocked in many fresh ponds and streams.	Atlantic Coast of North America from the Gulf of St. Lawrence & Nova Scotia to South Carolina.	Common
Mugil cephalus (Mullet)	Coastal waters	Both sides of the temperate Atlantic; from Brazil to Cape Cod on the American coast	Limited

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

January 24, 1977

Mr. V. L. Andreliunas
Chief, Operations Division
New England Division, Corps of Engineers
U. S. Department of the Army
424 Trapelo Road
Waltham, MA 02154

Dear Mr. Andreliunas:

This letter is in reference to the maintenance dredging of the Stony Creek Federal navigation project in Branford, Connecticut during the fiscal year 1977.

We concur with the Bureau of Sports Fisheries and Wildlife that the dredgings should be done during the period they stipulate.

Also that the spoil disposal site (New Haven) must meet with the State of Connecticut's stipulations and that any monitoring work necessary during and after be complied with.

Sincerely yours,

Stuart C. Peterson

Stuart C. Peterson
Acting Chief
Permits Branch

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

12 January 1977

Colonel John Chandler
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler:

The Department of Environmental Protection has reviewed the Corps proposal to dredge 28,500 cubic yards of sediment from the Stony Creek Federal Navigation Project in Branford and to dispose of the dredged materials in the vicinity of the historical New Haven dumping grounds. Previous monitoring and research studies on the environmental implications of dredged material disposal at the New Haven site have indicated the site is suitable for controlled disposal of dredged materials. We concur with early spring 1977 commencement of dredging and with open water disposal as proposed. However, before disposal activity resumes at this Central Long Island Sound Regional Disposal Area, certain management considerations as described below, should be implemented.

As you undoubtably know, the Department's approval of renewed use of the New Haven disposal area had been predicated on the development of a long-term disposal area management plan for the site. Yale University researchers have submitted their final reports to the Corps of Engineers which summarize the findings of their dump site studies undertaken between 1972 and 1976. A major recommendation of the Yale reports was that a site specific management plan be developed before resumption of disposal activity and that this plan provide for monitoring of certain conservative parameters on an ongoing basis. We endorse this recommendation and add that we both have an obligation to assess the chronic implications of long-term disposal activity in Long Island Sound. As a practical matter, the New England Division of the Corps is the cognizant lead agency for funding disposal area monitoring and management programs.

I think you would agree, disposal area management procedures should be established and implemented prior to renewed disposal at this or any other site in Long Island Sound. Our respective staff should discuss this matter prior to any Corps hearings regarding renewed disposal at a proposed Western Long Island Sound Regional Disposal Area in the vicinity of the historical Eatons Neck site.

The DEP has had considerable dialogue with New York DEC, federal resource agencies and the academic community regarding disposal area monitoring needs. In order to assure continuity of past monitoring or research efforts and to develop a better understanding of the long term chronic implications and cumulative effects of open water disposal activity, disposal sites in Long Island Sound need to be monitored on an ongoing basis. The Regional Disposal Area Monitoring Program elements described below were developed in the course of our continuing planning effort on a Long Island Sound Dredged Material Disposal

Policy. It represents the constraint this Department places at this time on the reopening of both a Central Long Island Sound and Western Long Island Sound regional disposal areas. Where good data already exist for these elements, new data need not be duplicated for purposes of establishing the required pre-disposal base line. They should however, be collected and made available as a concise base line statement. The program elements for the Central Long Island Sound site are proposed as follows:

1. In order to maximize confinement of dredged sediments to a small segment of the disposal area, disposal activity should be restricted to within 200 meters of a "permanent" dumping buoy, the position of which should be derived in coordination with the DEP and other cognizant parties. This dumping buoy should be retained in place as long as that particular point is utilized by the Corps or private dumpers. While "point dumping" of Stony Creek sediments is preferred, "controlled area" disposal is not to be ruled out in future disposal activity.

2. In order to monitor the long term disposition and the cumulative impact of sediments dumped in the disposal area, "pre-Stony Creek" disposal bathymetry should be determined and should include the area to be buoyed as in 1. above, as well as relevent reference features on the nearby bottom including the spoil mound created during dredging of Guilford and New Haven Harbors several years ago. Bathymetry in these same areas should be determined annually thereafter. Bathymetric survey data should be reduced to a form having utility for evaluating the temporal disposition of dredged materials placed in the area.

3. Based on monitoring results completed on the New Haven site, to date a "spoil mound monitoring block" and a "reference" or "control block" should be delineated for disposal area monitoring as outlined in 4 below, as well as future monitoring of specific disposal projects or for research as may be necessary, to evaluate the chronic implications and cumulative effects of disposal activity in the area. The control block should be established within Yale's "Northwest Control Area" and the spoil mound block established at the mound which was the subject of the previous studies. In the future, the spoil mound block should have stations added or deleted as: a. measurements merge with the reference block; or, b. sufficient information is obtained at the station; or, c. sampling becomes redundant; or d. station data become statistically or otherwise stable; or e. new questions are asked.

4. In addition to annual pre-and post-dump bathymetry as outlined in 2 above, the disposal area monitoring program should at the minimum include the following analyses of data collected each spring and fall:

a.) Physical and chemical analyses of sediments from each block giving special consideration to "tags" including molluscan death assemblages in recent and geologically older sediments. In addition to assisting in the evaluation of any long term spreading of dredged material from the disposal area, sediment analyses coupled with information on the infaunal benthic communities (b. below) would enable clear differentiation of dredge induced chronic effects from those variations induced by other causes including natural ecological cycles. Most importantly, this aspect of the program would obtain information regarding the diagenesis of dredged material in central Long Island Sound.

b.) Macrobenthic surveys. Benthic communities from both reference and spoil blocks should be surveyed each spring and fall. Benthic community analyses have utility not only for evaluating biological diagenesis of spoil, but for evaluating the subtle long term-chronic implications of disposal activities with regard to benthic community structure and function.

c.) Determination of body burden levels of specific pollutants in representative macrobenthic populations from spoil and reference blocks. This is the most direct as well as practical means of evaluating the long term implications of bioaccumulation and potential mobilization of toxicants into food chains. Several biologically active metals such as lead, cadmium, chromium and copper, and the potentially problematical hydrocarbons, should be evaluated annually in spring and fall. Determination of bulk tissue concentrations of various metals poses no particular analytical or interpretive problems. For hydrocarbons, it is recommended that animal tissues from spoil and reference blocks be subject to the appropriate hydrophobic extractions and the extracts run through a gas chromatograph to produce chromatogram displays of the hydrophobic chemical constituents in the tissue. Direct comparison of spoil mound and reference block chromatograms would indicate not only whether uptake is or is not occurring in conjunction with disposal activity but the specific chemical class on which future research attention should be focused if differential uptake of potentially problematical hydrocarbon chemicals is observed in disposal area animal populations.

d.) Visual inspection of spoil and reference blocks annually in spring and fall. Direct observation of sediments, benthic communities, finfish and shell fish including lobsters, is required to support and/or confirm interpretations based on data gathered through the remote sampling processes discussed above.

I believe the dump site monitoring program outlined above is essential to protect the interests of Connecticut and is cost-effective from the federal interest point of view, in that it is not tied to any individual disposal project but based on the clear assumption that a considerable volume of dredged material will be dumped at the site in the future by both the Corps of Engineers and private interests. Future project related disposal monitoring costs should be considerately reduced. If you have any questions on the specific details or design of this management proposal, you or members of your staff should contact Mr. Denis Cunningham of my staff at (203) 566-2588. I am looking forward to your comments and a confirmation of this matter.

Very truly yours,

M J Schneidermeyer

Melvin J. Schneidermeyer
DEPUTY COMMISSIONER

MJS:DC:jed

STATE OF CONNECTICUT
DEPARTMENT OF AGRICULTURE — AQUACULTURE DIVISION
ROGERS AVENUE • MILFORD, CONNECTICUT 06460
P.O. Box 97 TELEPHONE 874-0696

January 12, 1977

Mr. V. L. Andreliunas
Chief, Operations Division
Department of the Army
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Andreliunas:

The Aquaculture Division of the Connecticut State Department of Agriculture does not object to the request of:

The New England Division
U.S. Army Corps of Engineers

NEDOD-N
Maintenance Dredging, Stony Creek Harbor, Connecticut

to complete the work as stated on their application dated 17 December 1976.

This division does ask that no underwater work be carried on during the oyster spawning months of June through September.

Sincerely,

John.

John E. Baker
Division Chief

JEB:pt

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
New England Area Office
P. O. Box 1518
55 Pleasant Street
Concord, NH 03301

November 17, 1976

Division Engineer
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Sir:

Mr. Andreliuna's letter of October 15, 1976 requested our comments on your proposed maintenance dredging of the Stony Creek navigation project, Branford, New Haven County, Connecticut.

This report is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The Stony Creek project provides for a six-foot deep by 100-foot wide channel extending from deep water in Long Island Sound to a point 800 feet north of the Town Dock, and a 3.5 acre six-foot deep maneuvering basin at the head of the channel. Approximately 28,500 cubic yards of organic silt are to be removed to restore the project to its authorized dimensions. Since no acceptable land disposal areas are apparently available, the material is proposed to be disposed of at the New Haven Dumping Ground.

Regarding the dredging schedule, we concur with the early spring commencement of dredging. No dredging should occur during the months of June, July, or August, to prevent adverse impacts on oyster populations. We would also not expect any adverse impacts from disposal at the New Haven Dumping Ground. We do recommend that management practices to be finalized by the State of Connecticut and other interested agencies, regarding precise disposal location, monitoring efforts, etc., be followed.

Sincerely yours,

Melvin R. Evans
Field Supervisor, NEAO

MI bmt/RSS

RO, AEV
NMFS, Smith

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

E-16

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Federal Building, 14 Elm Street
Gloucester, Massachusetts 01930

December 15, 1976

Col. John P. Chandler
Division Engineer
Department of the Army
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler:

The National Marine Fisheries Service has reviewed Mr. Andreliunas' letter of October 15, 1976, requesting comments on the proposed maintenance dredging of the Stony Creek Federal Navigation project in Branford, Connecticut. The project provides for maintenance of a 100-foot wide channel, 6 feet deep, and a 3.5-acre maneuvering basin at the head of the channel. The dredged material will be spoiled at the New Haven Dumping Ground.

The coastal areas of Branford are concentrated areas of shellfish production and finfish abundance. Commencement of dredging in the early spring, however, should allow completion of the project prior to the spawning period for oysters. No work should be performed during the period July 15 to September 30, which corresponds to the peak period of spawning and setting by oysters.

Regarding the New Haven Dumping Ground, we recommend that the disposal management program being formulated by the State of Connecticut be followed. More precise information on disposal location, monitoring, and survey can be provided at a later time when this program has firmly established the disposal site.

Sincerely yours, Marvin J. Bowen

for

William G. Gordon
Regional Director

21 DEC 1976

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDOD-N 17 December 1976
Maintenance Dredging, Stony Creek Harbor, Connecticut

PUBLIC NOTICE

The New England Division, U.S. Army Corps of Engineers is planning to perform maintenance dredging in the Federal navigation project at Stony Creek Harbor, Connecticut. The Stony Creek project which was adopted in 1967 provides for: a channel six feet deep from deep water in Long Island to approximately 800 feet north of the Town Wharf; and a maneuvering basin six feet deep and 3.5 acres adjacent to the upper end of the channel. The existing project was completed in 1970.

The proposed work will include dredging the channel and maneuvering basin to a depth of six feet at mean low water. The dredging will entail the removal of approximately 28,500 cubic yards of material which is primarily organic silt. A clamshell dredge will be used to excavate the material and place it in scows which will be hauled to and dumped within the New Haven Disposal Area in Long Island Sound. The area is rectangular in shape with sides of one nautical mile running true north-south and two nautical miles running east-west. Point dumping will be employed with the exact location to be selected following final coordination between the U.S. Environmental Protection Agency and the Connecticut Department of Environmental Protection. The inclosure shows the area to be dredged and the proposed disposal area.

The dredging will be performed by a private contractor under a contract with the Government. The work is scheduled to commence in April 1977 and to be completed during May 1977. This schedule will avoid conflicts with the recreational activities during the summer months and avoid any adverse impacts on the shellfish resources.

The proposed work will be reviewed under the provisions of Section 313 and 404 of the Federal Water Pollution Control Act (33 U.S. Code, Sections 1323 and 1344).

There may be some concurrent dredging activity in the Stony Creek vicinity as there is a permit on file with the New England Division

AMERICAN REVOLUTION BICENTENNIAL 1776-1976 which has been issued to the New Haven Trap Rock Company. The current permit allows for maintenance dredging of the barge loading facility at the company's facility in the Pine Orchard section of Branford. Under terms of this permit, the dredged material was to be dumped at the Bridgeport Dumping Grounds; however, the designation of Bridgeport is subject to review and change in light of information developed since the permit was issued. There is also a permit application on file with this office from the Thimble Island Electric Cooperative, Inc. to entrench a cable which is to run from Stony Creek Village to Burr Island. The proposed work is scheduled to be accomplished this spring.

The project is being coordinated with the Connecticut Department of Environmental Protection, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency and the National Marine Fisheries Service.

The Division Engineer has made a preliminary determination that an Environmental Impact Statement is not required under the provisions of the National Environmental Policy Act of 1969. This determination will be reviewed in light of facts submitted in response to the notice herein.

Designation of the above described proposed disposal site for dredged material associated with maintenance of the referenced navigation project shall be made through the application of guidelines promulgated by the Administrator, U.S. Environmental Protection Agency, in conjunction with the Secretary of the Army. If these guidelines alone prohibit the designation of this proposed disposal site, any potential impairment to the maintenance of navigation, including any economic impact on navigation which would result from failure to use this disposal site, will also be considered.

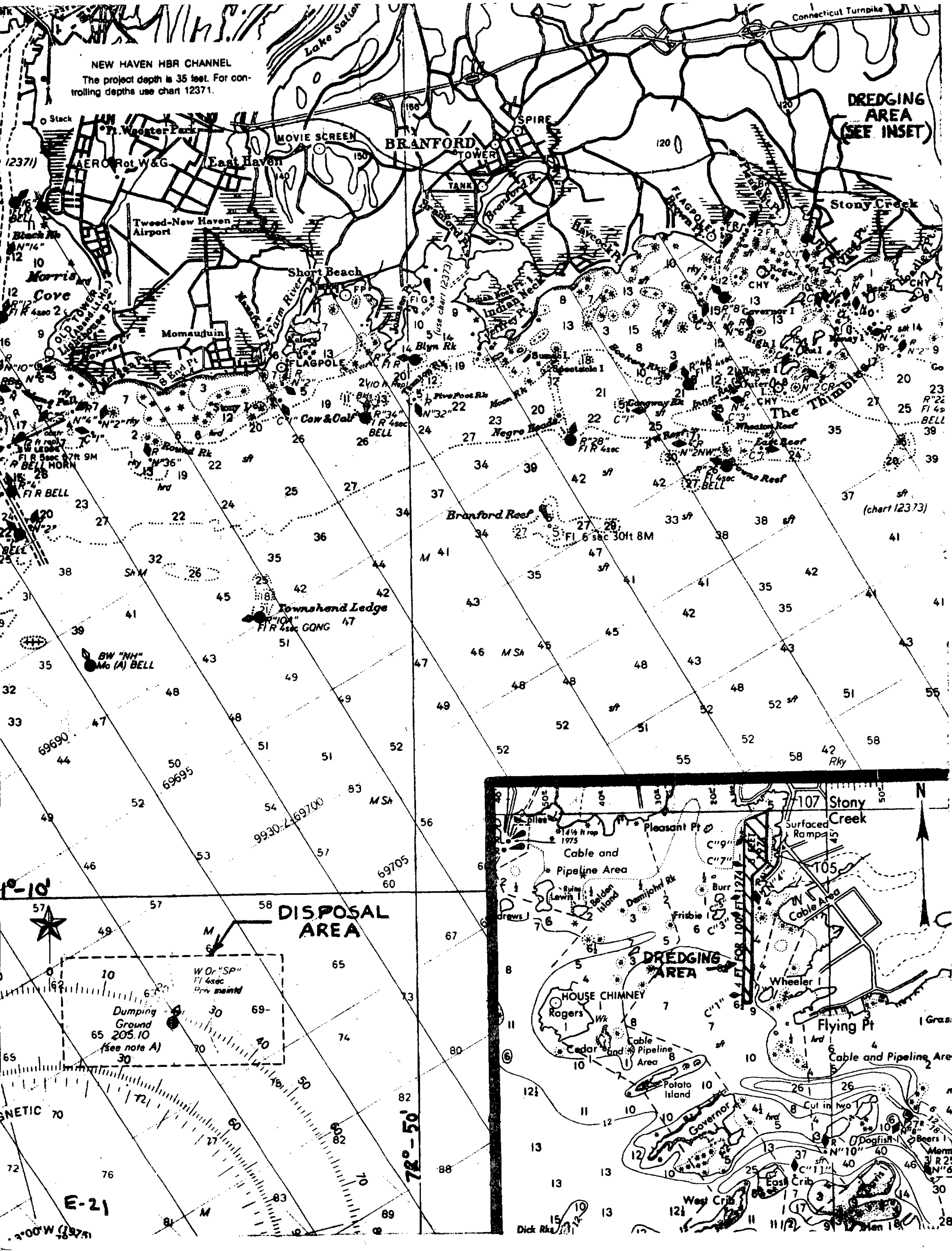
The decision to use the above described disposal area will be based on an evaluation of the probable impact which the action will have on the public interest. The decision will reflect the national concern for both the maintenance of interstate and foreign commerce and the protection and utilization of important national resources. The benefits which reasonably may be expected to accrue from this dredging activity will be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered: among these are conservation, economics, aesthetics, fish and wildlife values, land use classification, the need to maintain navigation, recreation, water quality and, in general, the needs and welfare of the people.

Any person who has an interest which may be affected by the disposal of this dredged material may request a public hearing. The request must be submitted in writing to the Division Engineer within 30 days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity. Statements should indicate that they are in response to this announcement.

This notice is in compliance with the notice provisions of Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S. Code, Section 1344).

Please bring this notice to the attention of anyone you know to be interested in this project. Comments, which are invited from all interested parties, should be directed to the Division Engineer, 424 Trapelo Road, Waltham, MA 02154, ATTN: Navigation Branch within 30 days of the date of this notice.

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer



NEW HAVEN HBR CHANNEL
The project depth is 35 feet. For controlling depths use chart 12371.
Connecticut Turnpike
Lake Saltonstall
DREDGING AREA (SEE INSET)
BRANFORD
SPIRE
TOWER
TANK
MOVIE SCREEN
East Haven
Ft. Wooster Park
Tweed-New Haven Airport
Morris Cove
Momauguin
Short Beach
Farm River
Branford R.
Stony Creek
Indian Neck
Governor I
The Thimbles
Branford Reef
Townshend Ledge
Negro Heads
Cow & Calf
Blyn Rk
Round Rk
Stony Creek
Pleasant Pt
Cable and Pipeline Area
DREDGING AREA
HOUSE CHIMNEY
Rogers
Cedar
Potato Island
Governor
Flying Pt
Wheeler I
Frisbie I
Burr
Belden Island
Lewis I
West Crib
East Crib
Dogfish
Surfaced Ramp
DISPOSAL AREA
Dumping Ground 205.10 (See note A)
W Or "SP" Fl 4sec Priv maintd
BW "NH" Mo (A) BELL
Fl 6 sec 30ft 8M
(chart 12373)
72°-50'
E-21

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

12 January 1977

Colonel John Chandler
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler:

The Department of Environmental Protection has reviewed the Corps proposal to dredge 28,500 cubic yards of sediment from the Stony Creek Federal Navigation Project in Branford and to dispose of the dredged materials in the vicinity of the historical New Haven dumping grounds. Previous monitoring and research studies on the environmental implications of dredged material disposal at the New Haven site have indicated the site is suitable for controlled disposal of dredged materials. We concur with early spring 1977 commencement of dredging and with open water disposal as proposed. However, before disposal activity resumes at this Central Long Island Sound Regional Disposal Area, certain management considerations as described below, should be implemented.

As you undoubtably know, the Department's approval of renewed use of the New Haven disposal area had been predicated on the development of a long-term disposal area management plan for the site. Yale University researchers have submitted their final reports to the Corps of Engineers which summarize the findings of their dump site studies undertaken between 1972 and 1976. A major recommendation of the Yale reports was that a site specific management plan be developed before resumption of disposal activity and that this plan provide for monitoring of certain conservative parameters on an ongoing basis. We endorse this recommendation and add that we both have an obligation to assess the chronic implications of long-term disposal activity in Long Island Sound. As a practical matter, the New England Division of the Corps is the cognizant lead agency for funding disposal area monitoring and management programs.

I think you would agree, disposal area management procedures should be established and implemented prior to renewed disposal at this or any other site in Long Island Sound. Our respective staff should discuss this matter prior to any Corps hearings regarding renewed disposal at a proposed Western Long Island Sound Regional Disposal Area in the vicinity of the historical Eatons Neck site.

The DEP has had considerable dialogue with New York DEC, federal resource agencies and the academic community regarding disposal area monitoring needs. In order to assure continuity of past monitoring or research efforts and to develop a better understanding of the long term chronic implications and cumulative effects of open water disposal activity, disposal sites in Long Island Sound need to be monitored on an ongoing basis. The Regional Disposal Area Monitoring Program elements described below were developed in the course of our continuing planning effort on a Long Island Sound Dredged Material Disposal

C

Policy. It represents the constraint this Department places at this time on the reopening of both a Central Long Island Sound and Western Long Island Sound regional disposal areas. Where good data already exist for these elements, new data need not be duplicated for purposes of establishing the required pre-disposal base line. They should however, be collected and made available as a concise base line statement. The program elements for the Central Long Island Sound site are proposed as follows:

1. In order to maximize confinement of dredged sediments to a small segment of the disposal area, disposal activity should be restricted to within 200 meters of a "permanent" dumping buoy, the position of which should be derived in coordination with the DEP and other cognizant parties. This dumping buoy should be retained in place as long as that particular point is utilized by the Corps or private dumpers. While "point dumping" of Stony Creek sediments is preferred, "controlled area" disposal is not to be ruled out in future disposal activity.

2. In order to monitor the long term disposition and the cumulative impact of sediments dumped in the disposal area, "pre-Stony Creek" disposal bathymetry should be determined and should include the area to be buoyed as in 1. above, as well as relevent reference features on the nearby bottom including the spoil mound created during dredging of Guilford and New Haven Harbors several years ago. Bathymetry in these same areas should be determined annually thereafter. Bathymetric survey data should be reduced to a form having utility for evaluating the temporal disposition of dredged materials placed in the area.

3. Based on monitoring results completed on the New Haven site, to date a "spoil mound monitoring block" and a "reference" or "control block" should be delineated for disposal area monitoring as outlined in 4 below, as well as future monitoring of specific disposal projects or for research as may be necessary, to evaluate the chronic implications and cumulative effects of disposal activity in the area. The control block should be established within Yale's "Northwest Control Area" and the spoil mound block established at the mound which was the subject of the previous studies. In the future, the spoil mound block should have stations added or deleted as: a. measurements merge with the reference block; or, b. sufficient information is obtained at the station; or, c. sampling becomes redundant; or d. station data become statistically or otherwise stable; or e. new questions are asked.

4. In addition to annual pre-and post-dump bathymetry as outlined in 2 above, the disposal area monitoring program should at the minimum include the following analyses of data collected each spring and fall:

a.) Physical and chemical analyses of sediments from each block giving special consideration to "tags" including molluscan death assemblages in recent and geologically older sediments. In addition to assisting in the evaluation of any long term spreading of dredged material from the disposal area, sediment analyses coupled with information on the infaunal benthic communities (b. below) would enable clear differentiation of dredge induced chronic effects from those variations induced by other causes including natural ecological cycles. Most importantly, this aspect of the program would obtain information regarding the diagenesis of dredged material in central Long Island Sound.

b.) Macrobenthic surveys. Benthic communities from both reference and spoil blocks should be surveyed each spring and fall. Benthic community analyses have utility not only for evaluating biological diagenesis of spoil, but for evaluating the subtle long term-chronic implications of disposal activities with regard to benthic community structure and function.

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Very truly yours,

M J Schneidermeyer

Melvin J. Schneidermeyer
DEPUTY COMMISSIONER

MJS:DC:jed